



IBM

Field Engineering
Diagram Manual

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2250 Display Unit Model 1

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2250 Display Unit Model 1

PREFACE

This manual contains the maintenance-oriented and "re-call" diagrams referenced in the 2250-1 Display Unit FE Theory of Operation Manual, Form Y27-2043, and FE Maintenance Manual, Form Y27-2045. Placing the diagrams in this manual allows ready reference during maintenance.

The diagrams are in numerical order, grouped according to type. Diagram numbers are consecutive only within a diagram type.

Related manuals that may be used for reference are:
2250-1 FETOM, Form Y27-2043.
2250-1 FEMM, Form Y27-2045.
2250-1 Installation Manual (FEIM), Form 226-2022.

This diagram manual supersedes the 2250-1 FE Diagram Manual, Form Y27-2044-0. Major changes are the addition of diagrams to cover the graphic design feature and the updating of existing diagrams. A block diagram of the 2250-1, an intensity diagnostic flow chart, and a diagram of the arc-protection circuit have also been added.

If the 2250 is equipped with the graphic design feature (GDF), use the diagrams listed in column 2 below instead of those listed in column 1. Any reference to a diagram listed in column 1 (when concerned with GDF) should be interpreted as a reference to its counterpart in column 2.

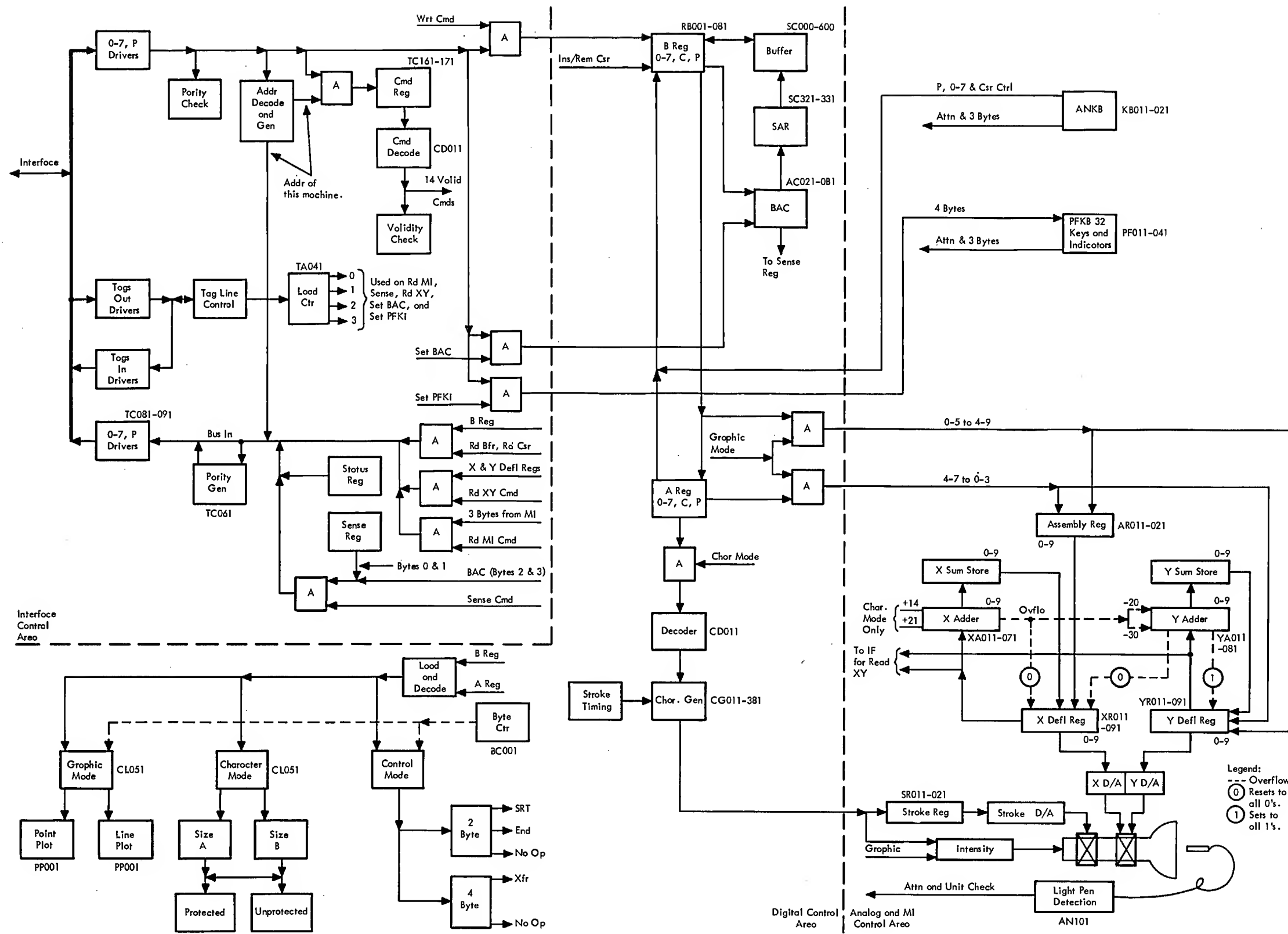
Column 1	Column 2
Basic Diagrams which	GDF
<u>have GDF counterparts</u>	<u>Counterparts</u>
Figure 5007	Figure 5007 GDF
Figure 5023	Figure 5023 GDF
Figure 6001	Figure 6001 GDF
Figure 6005	Figure 6005 GDF
Figure 6007	Figure 6007 GDF
Figure 6008	Figure 6008 GDF
Figure 6010	Figure 6010 GDF
Figure 6013	Figure 6013 GDF
Figure 6015	Figure 6015 GDF
Figure 6037	Figure 6037 GDF
Figure 9003	Figure 9003 GDF
Figure 9022	Figure 9022 GDF

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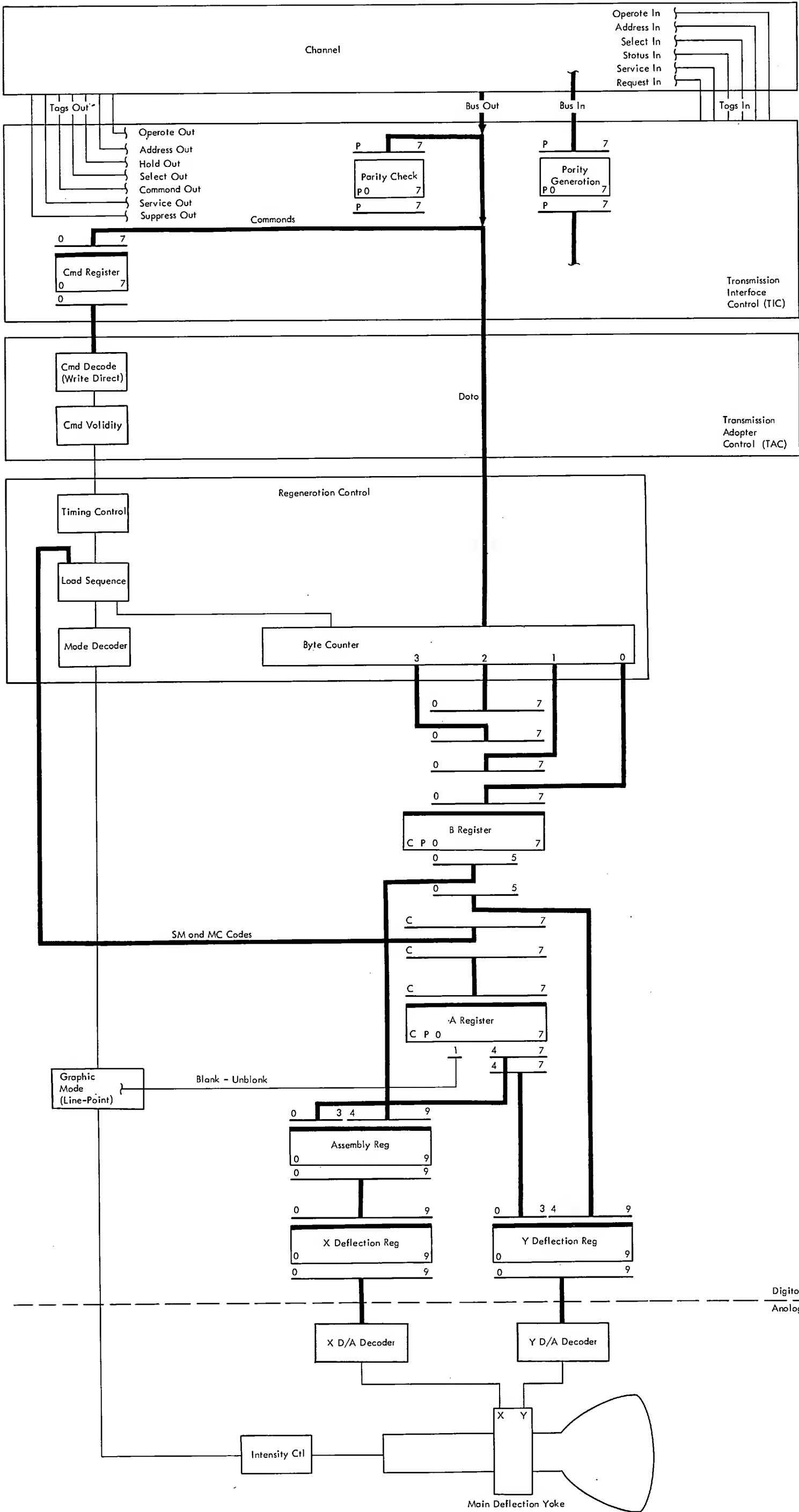
CONTENTS

2250-1 BLOCK DIAGRAM.	1000	Buffer Regeneration, MC Search and Proceed G, Flow Chart	6010
UNIT DATA AND CONTROL DIAGRAMS		Buffer Regeneration, MC Search and Proceed G, Flow Chart (for GDF Machines)	6010GDF
Standard Unit, Write Direct Operation (Non Buffered Machine).	2000	Buffer Regeneration, Proceed B, Cursor Adjustment Process, Flow Chart	6011
Standard Unit with Character Generator Operation	2001	Buffer Regeneration, Proceed C and Proceed F, Character Mode, Flow Chart	6012
Program Function Keyboard, Data Entry Operation	2002	Buffer Regeneration, Proceed C and Proceed E, Graphic, Transfer and No Op Modes, Flow Chart	6013
Program Function Keyboard, Indicator Control Operation	2003	Buffer Regeneration, Proceed C and Proceed E, Graphic, Transfer and No Op Modes, Flow Chart (for GDF Machines)	6013GDF
Standard Unit with Alphanumeric Keyboard, Data Entry Operation	2004	Buffer Regeneration, Buffer Cycle, Flow Chart	6014
Standard Unit with Light Pen, Data Entry Operation	2005	Buffer Regeneration, Transfer Order Process, Flow Chart	6015
Write Buffer Operation	2006	Buffer Regeneration, Transfer Order Process, Flow Chart (for GDF Machines)	6015GDF
Set BAC Operation	2007	Transmission Interface Control, Initial Selection Sequence, Flow Chart (4 Sheets)	6016
Display Regeneration Operation	2008	Transmission Interface Control, Service Cycle Sequence, Flow Chart	6017
Alphanumeric Keyboard, Data Entry into Buffer Storage	2009	Transmission Interface Control, Ending Sequence, Flow Chart	6018
Light Pen Character Detect, BAC Control	2010	Set Buffer Address Command, Flow Chart	6019
Light Pen Absolute Graphic Detect, BAC Control	2011	Insert-Remove Cursor Command, Flow Chart	6020
Read Buffer Operation	2012	Set Program Function Keyboard Indicators Command, Flow Chart	6021
Read Sense Operation	2013	Write Direct Command, Flow Chart	6022
Read X-Y Position Registers Operation	2014	Write Buffer Command, Flow Chart	6023
CRT Beam Deflection and Control, Block Diagram	2015	Read Buffer Command, Flow Chart	6024
Yoke Current Distribution, Full X Deflection	2016	Read Cursor Command, Flow Chart	6025
Character Deflection and Control, Block Diagram	2017	Read Manual Inputs Command, Flow Chart	6026
Character Generator, Block Diagram	2018	Read X-Y Position Registers Command, Flow Chart	6027
SIMPLIFIED LOGIC DIAGRAMS		Sense Command, Flow Chart	6028
Typical Character Generator Operation, Logic Diagram	5000	Power On Sequence	6029
B Register, Functional Diagram	5001	Power Off Sequence	6030
A Register, Functional Diagram	5002	Analog Diagnostic Master Flow Chart	6031
Status Register, Functional Diagram (2 Sheets)	5003	Serious Display Defect Test Flow Charts	6032
Sense Register, Bytes 1 and 2, Functional Diagram	5004	Large Square Test Display Flow Chart	6033
Sense Register, Bytes 3 and 4, Functional Diagram	5005	Staircase Test Display Flow Chart (2 Sheets)	6034
Buffer Address Register, Functional Diagram	5006	Vector and Point Plot Fans Test Display Flow Chart	6035
Byte Counter, Functional Diagram	5007	Character Generator Test Flow Chart (2 Sheets)	6036
Byte Counter, Functional Diagram (for GDF Machines)	5007GDF	Light Pen Test Flow Chart	6037
Load Counter, Functional Diagram	5008	Light Pen Test Flow Chart (for GDF Machines)	6037GDF
Buffer Address Counter, Functional Diagram (2 Sheets)	5009	De-Skew Test Flow Chart	6038
Command Validation, Functional Diagram (2 Sheets)	5010	Character Stroke Control, Flow Chart	6039
First Timing Period, Functional Diagram	5011	Character Sequencer, Flow Chart	6040
Second Timing Period, Functional Diagram	5012	Absolute Vector Graphics Diagnostic Test Flow Chart	6041
Third Timing Period, Functional Diagram	5013	Intensity Test Flow Chart	6042
Fourth Timing Period, Functional Diagram	5014	ADDITIONAL INFORMATION	
Fifth Timing Period, Functional Diagram	5015	Size A Characters, Display Distribution	9000
Timing Pulse Generator, Functional Diagram	5016	Size B Characters, Display Distribution	9001
Stroke Timing and Control	5017	A/N Keyboard, Encoding Chart	9002
A/N Keyboard Data Encoding Diagram	5018	Power Control and Distribution Wiring Diagram (3 Sheets)	9003
A/N Keyboard Sense and Cursor Data Generation	5019	Power Control and Distribution Wiring Diagram (for GDF Machines) (3 Sheets)	9003GDF
A/N Keyboard Code Generation and Transfer.	5020	High Voltage Power Supply Wiring Diagram	9004
Program Function Keyboard Data Encode and Entry.	5021	Power Distribution	9005
A/N and PF Keyboards Interrupt	5022	2250 CE Panel	9006
Light Pen Deflection	5023	Character Stroke Timing Chart	9007
Light Pen Deflection (for GDF Machines)	5023GDF	Main Deflection, High-Order Decoding and Control, Wiring Diagram	9008
Absolute Vector Graphics Control (2 Sheets)	5024	Main Deflection, Low-Order Decoding and Control, Wiring Diagram	9009
FLOW CHARTS		Main Deflection, DC Offset Control, Wiring Diagram	9010
Write Direct Command Process, Simplified Flow Chart	6000	Main Deflection, Yoke Control Circuits, Wiring Diagram	9011
Buffer Regeneration Timing Sequence, Simplified Flow Chart.	6001	Main Deflection, De-Skew Control Circuits, Wiring Diagram	9012
Buffer Regeneration Timing Sequence, Simplified Flow Chart (for GDF Machines)	6001GDF	Main Deflection, Position Isolation and Asynchronous Delay Circuits, Wiring Diagram.	9013
SM Search-Write, No Buffer, Flow Chart	6002	Dynamic Intensity I and Blank-Unblank I Circuits, Wiring Diagram	9014
MC Search-Write, No Buffer, Flow Chart	6003	Dynamic Intensity Blank-Unblank II Circuits, Wiring Diagrams	9015
Mode Sequence - Graphic or Character No Buffer, Flow Chart	6004		
Line/Point Sequence, Flow Chart	6005		
Line/Point Sequence, Flow Chart (for GDF Machines)	6005GDF		
Character Sequence, Flow Chart	6006		
Deflection Interlock Wait (No LP Detect) Flow Chart	6007		
Deflection Interlock Wait (No LP Detect) Flow Chart (for GDF Machines)	6007GDF		
Light Pen Detection Process, Flow Chart	6008		
Light Pen Detection Process, Flow Chart (for GDF Machines).	6008GDF		
Buffer Regeneration, Proceed A and Proceed D, SM Search, Flow Chart	6009		

Character Deflection, Decode Circuits, Wiring Diagrams	9016	Absolute Vector Graphics Deflection Control, Delta Counter	
Character Deflection, Reference Voltage Supply, Wiring		Switching Circuits	9020
Diagram	9017	Yoke Clamp Circuits	9021
Character Deflection, Yoke Control and Character		Light Pen Amplifier Wiring Diagram	9022
Isolation Circuits, Wiring Diagrams	9018	Light Pen Amplifier Wiring Diagram (for GDF Machines) . .	9022GDF
Absolute Vector Graphics Deflection Control, Typical		Display Unit Analog Control Block Diagram (2 Sheets) . . .	9023
Switch and Reference Voltage Circuits	9019	Arc Protection Circuit and Component Location.	9024



• Figure 1000. 2250-1 Block Diagram



●Figure 2000. Standard Unit, Write Direct Operation (Non Buffered Machine)

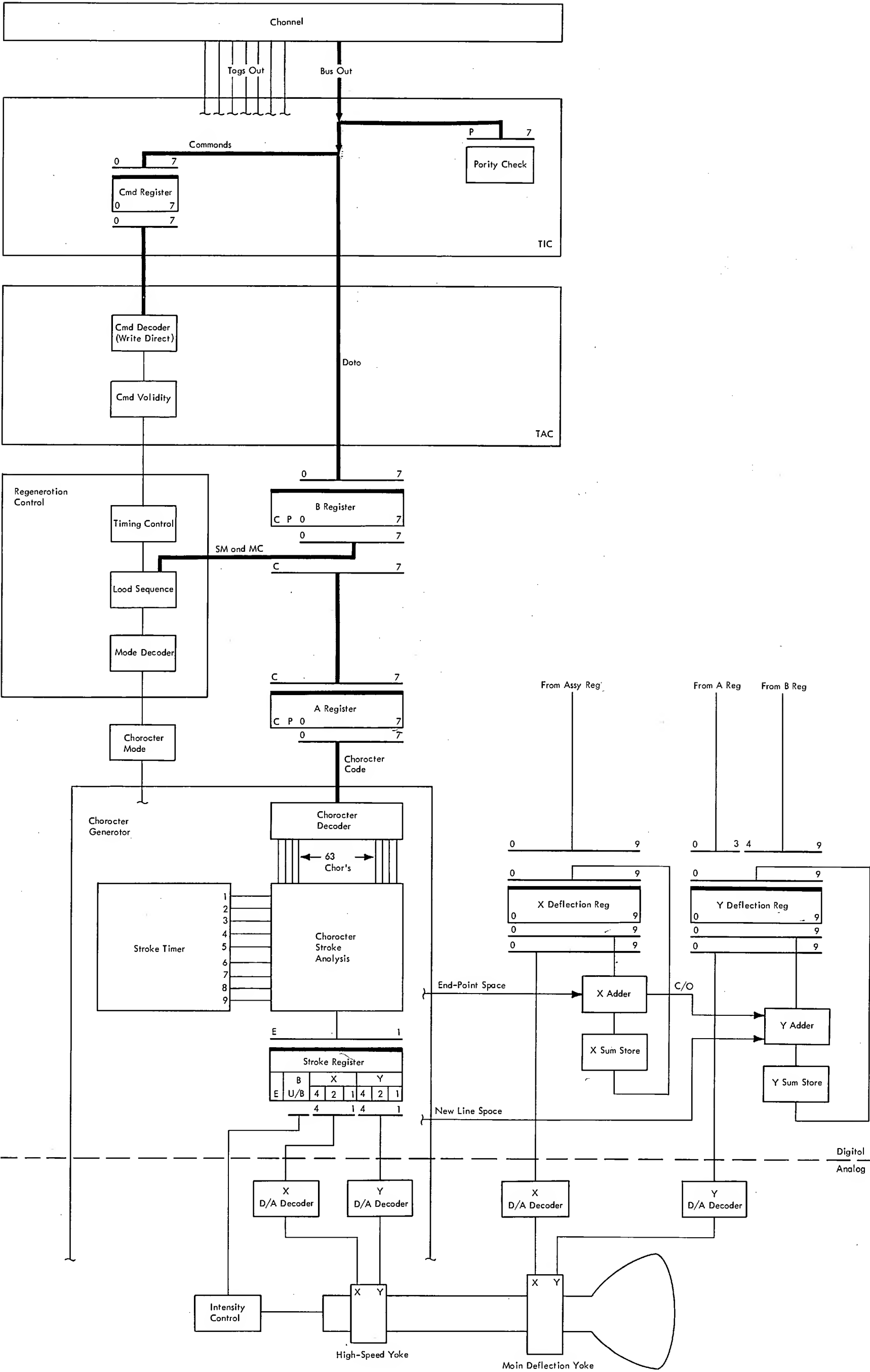


Figure 2001. Standard Unit with Character Generator Operation

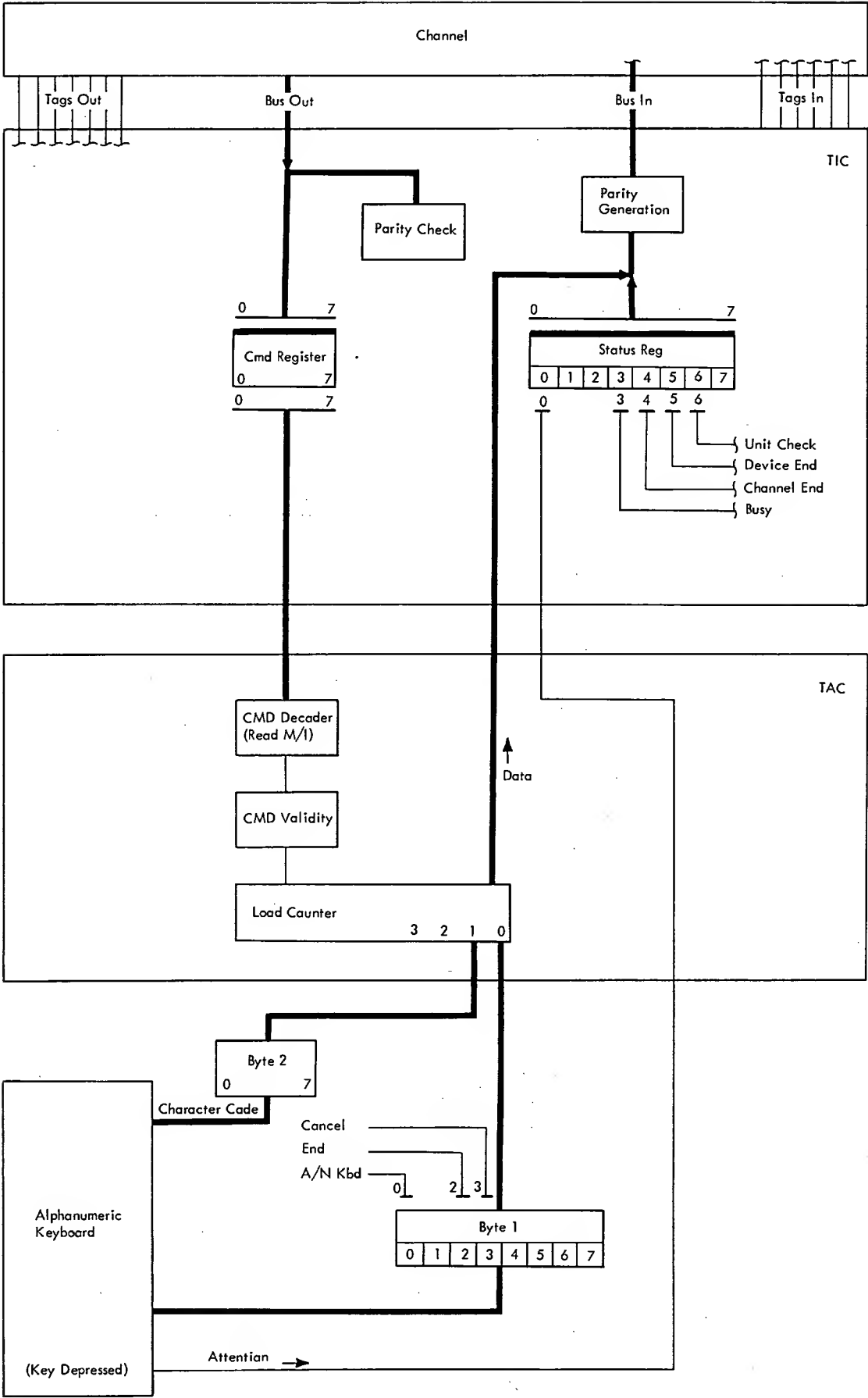


Figure 2004. Standard Unit with Alphabetic Keyboard, Data Entry Operation

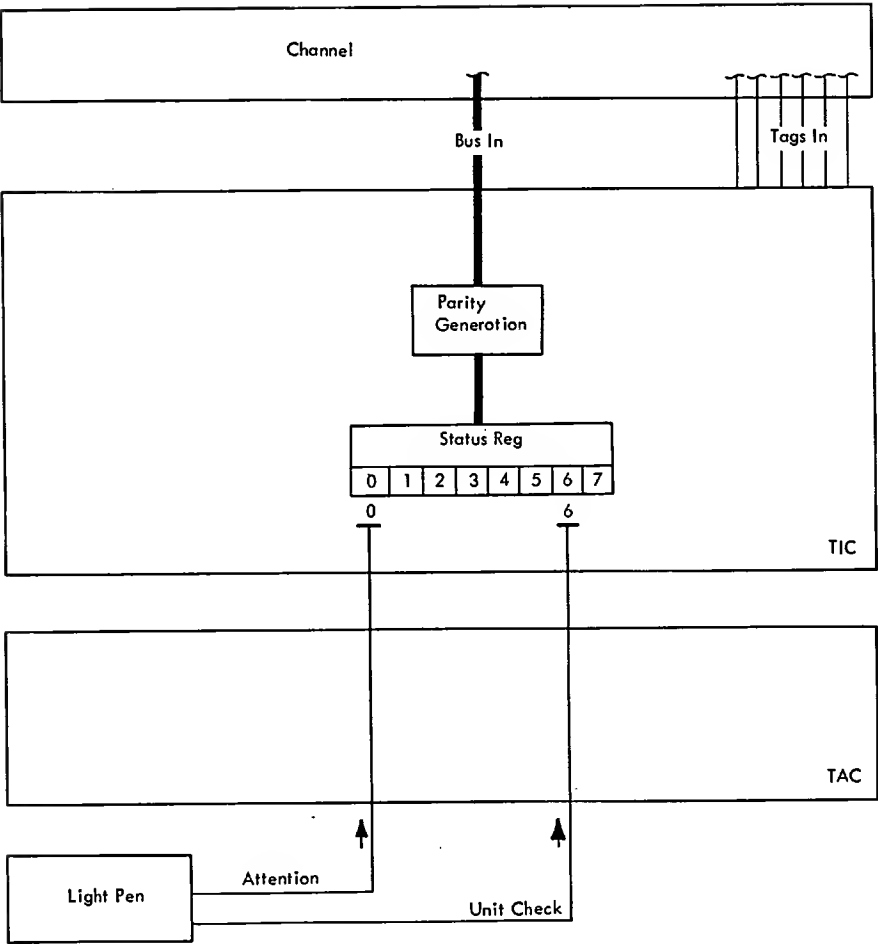
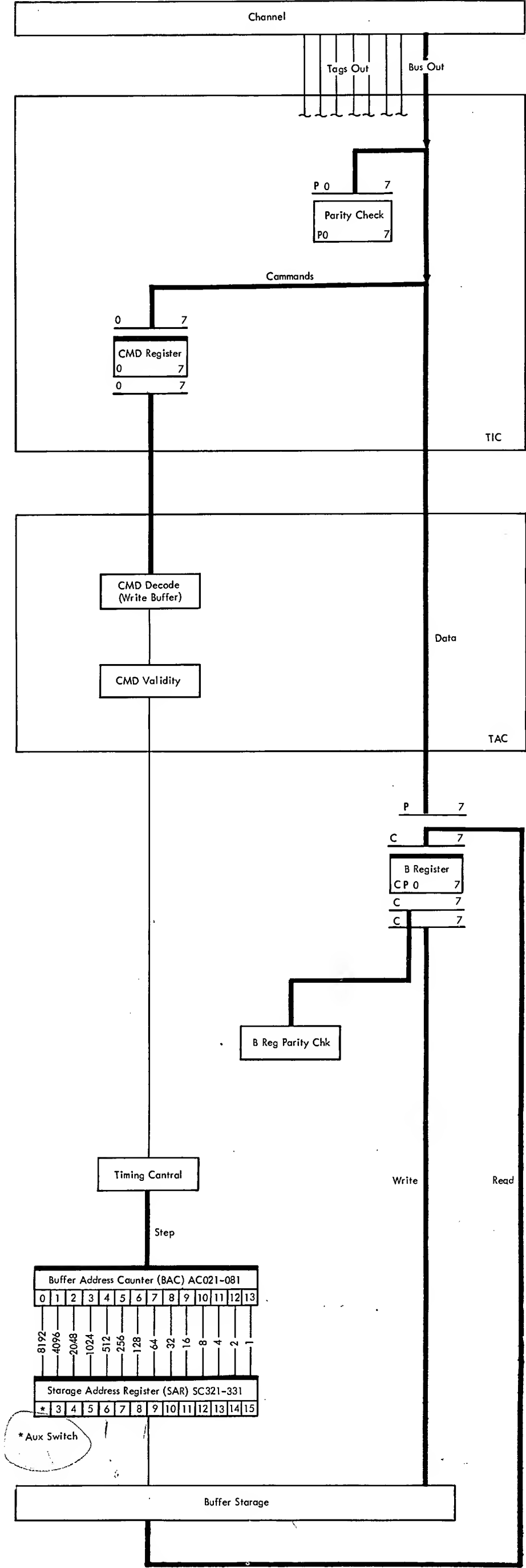


Figure 2005. Standard Unit with Light Pen, Data Entry Operation



●Figure 2006. Write Buffer Operation

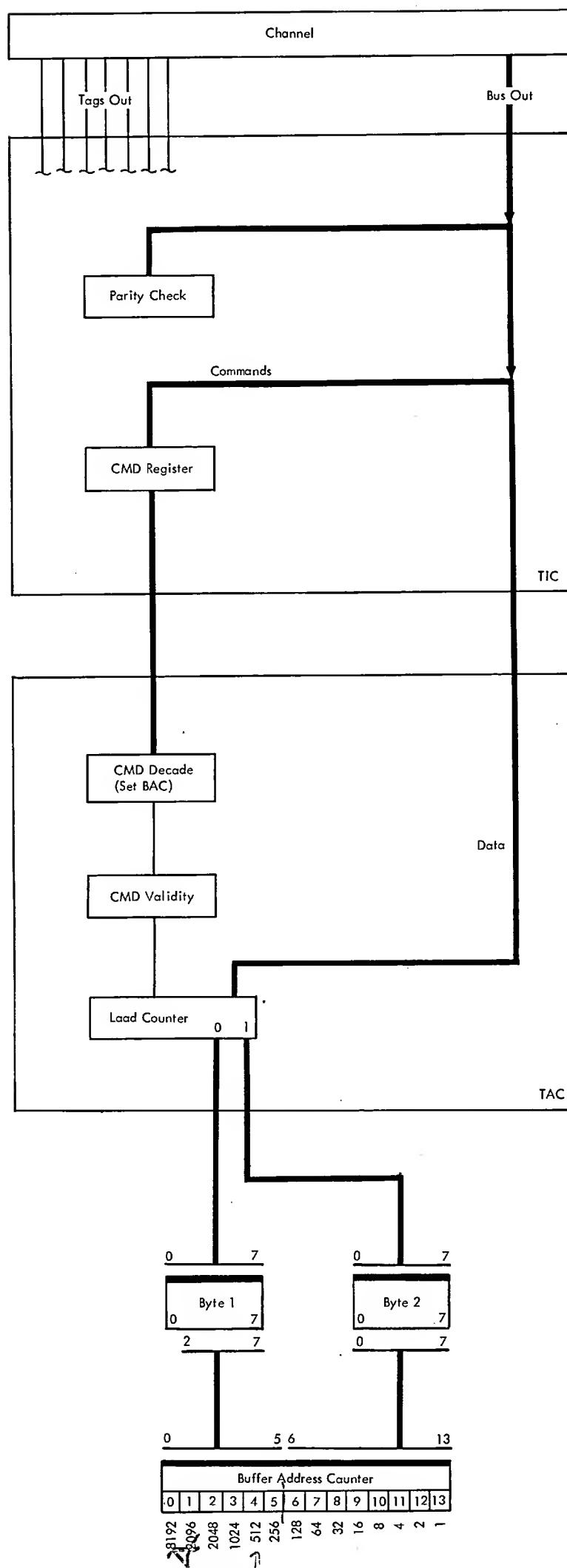
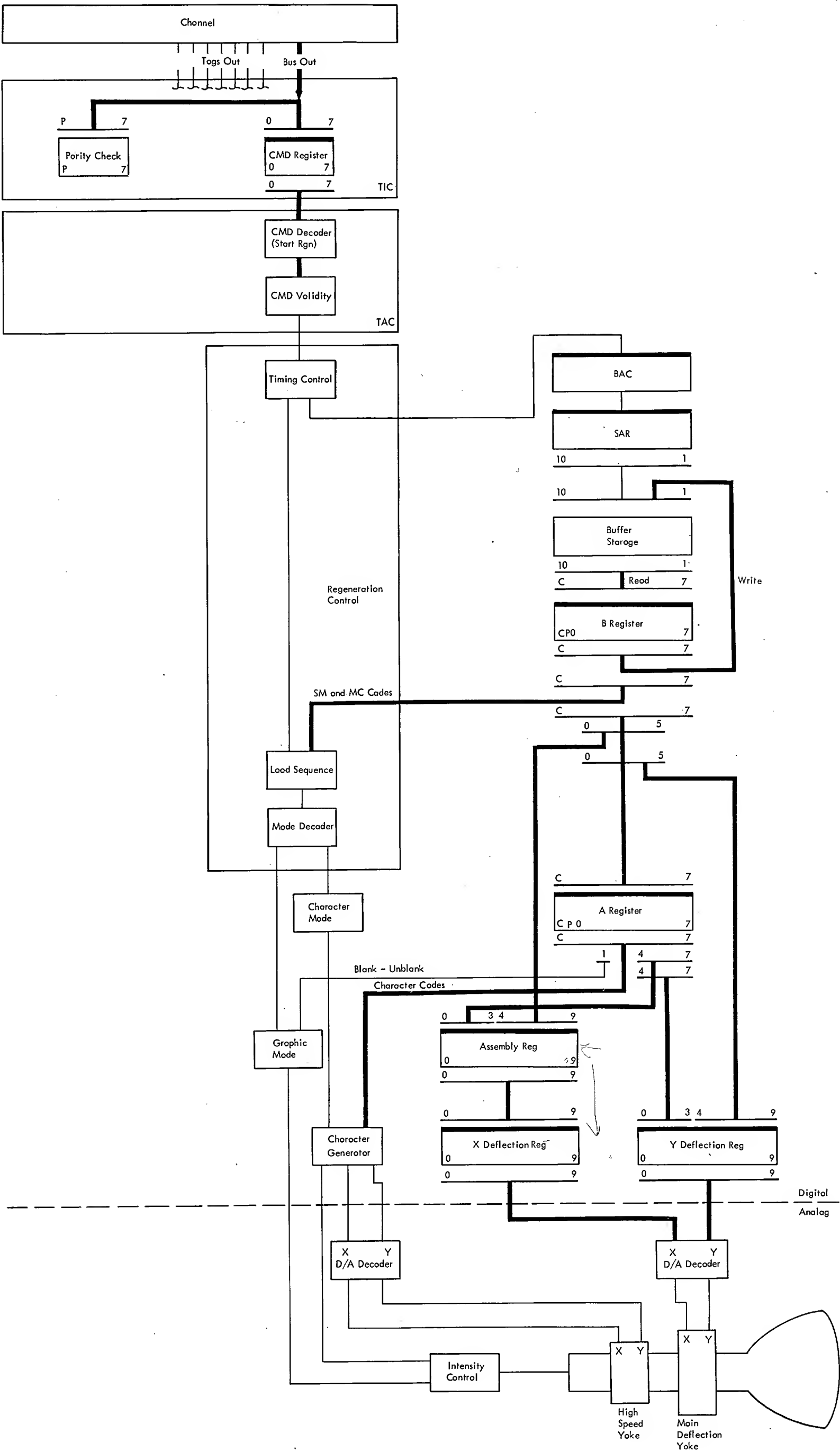
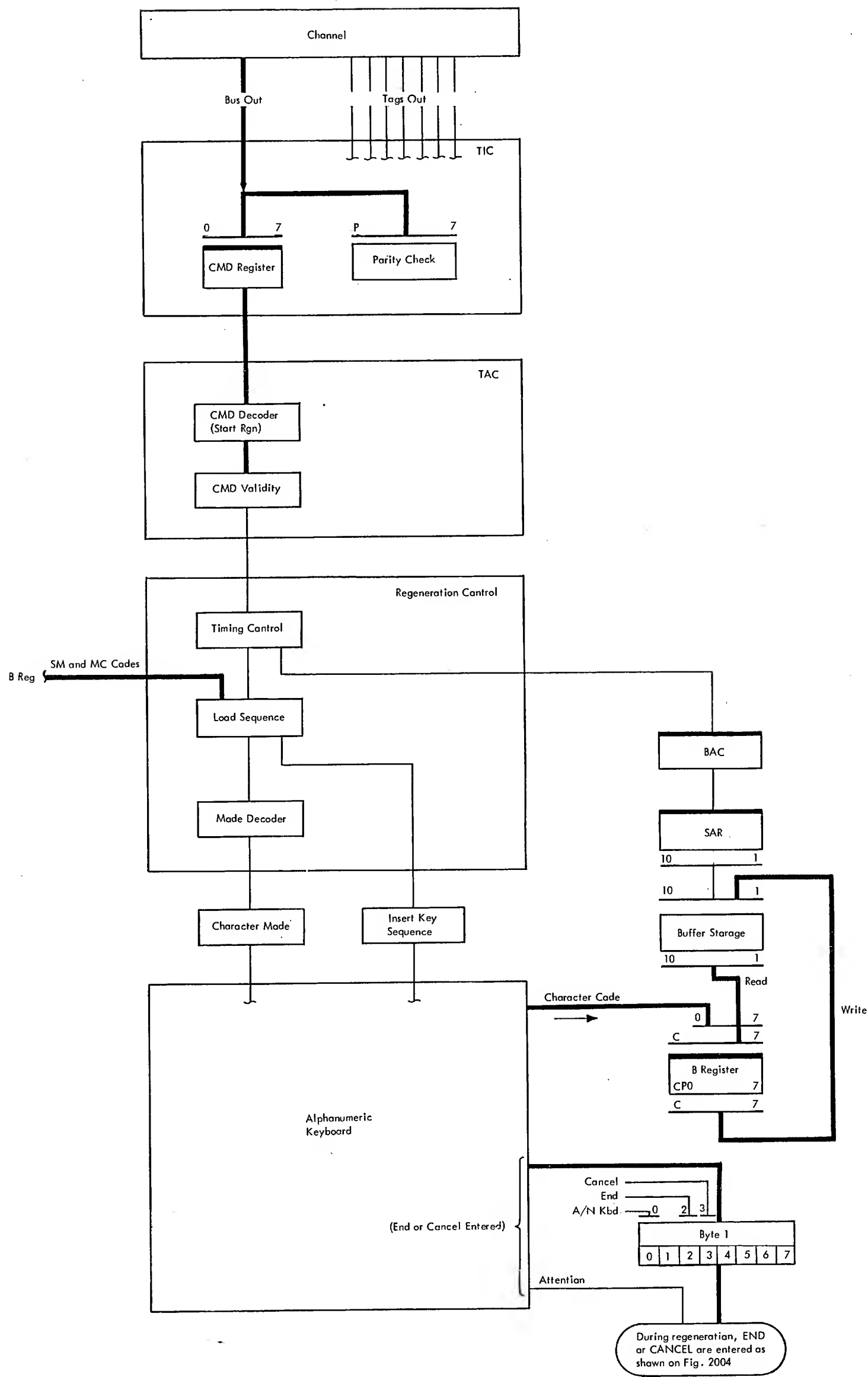


Figure 2007. Set BAC Operation



●Figure 2008. Display Regeneration Operation



• Figure 2009. Alphanumeric Keyboard, Data Entry into Buffer Storage

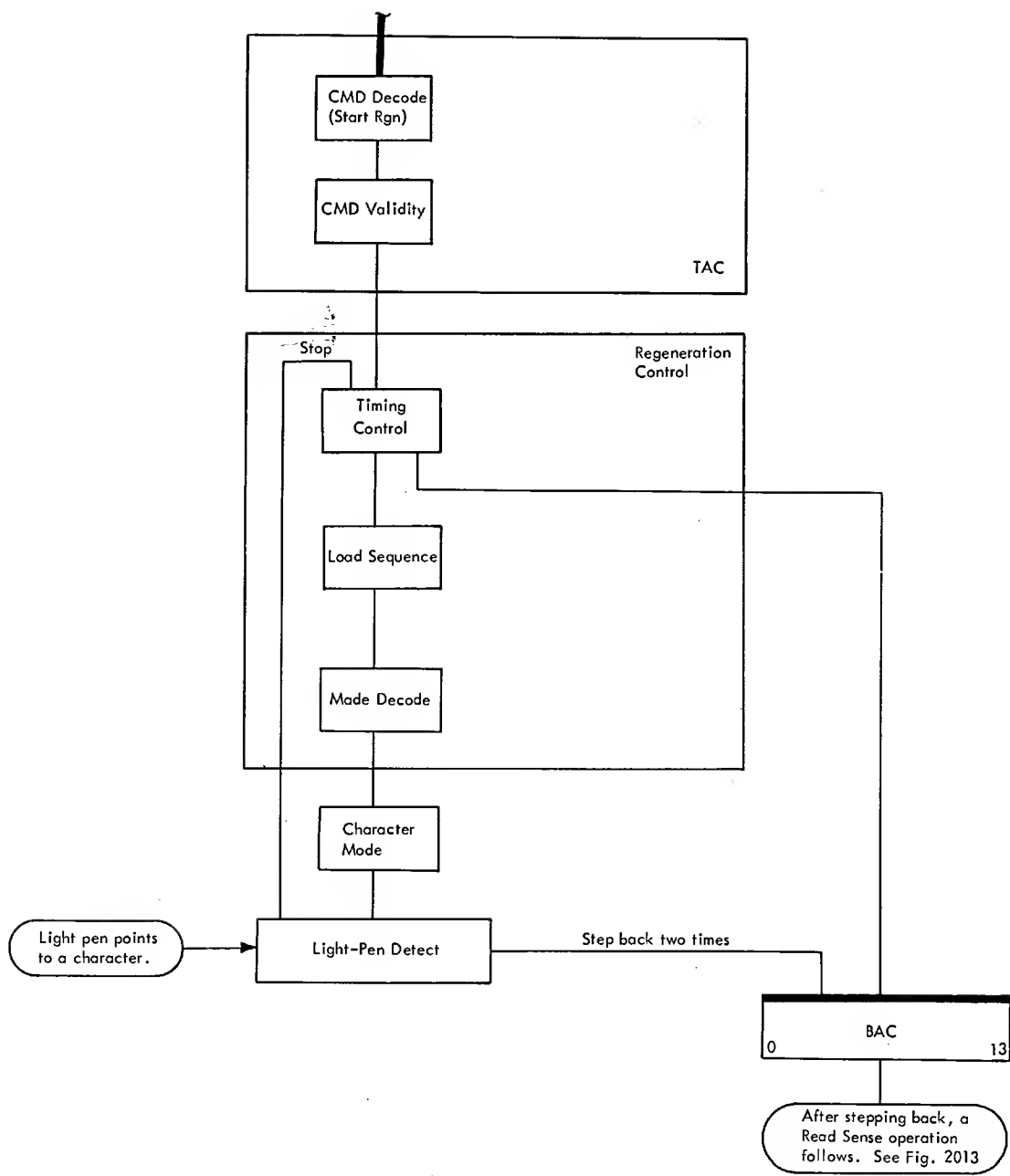
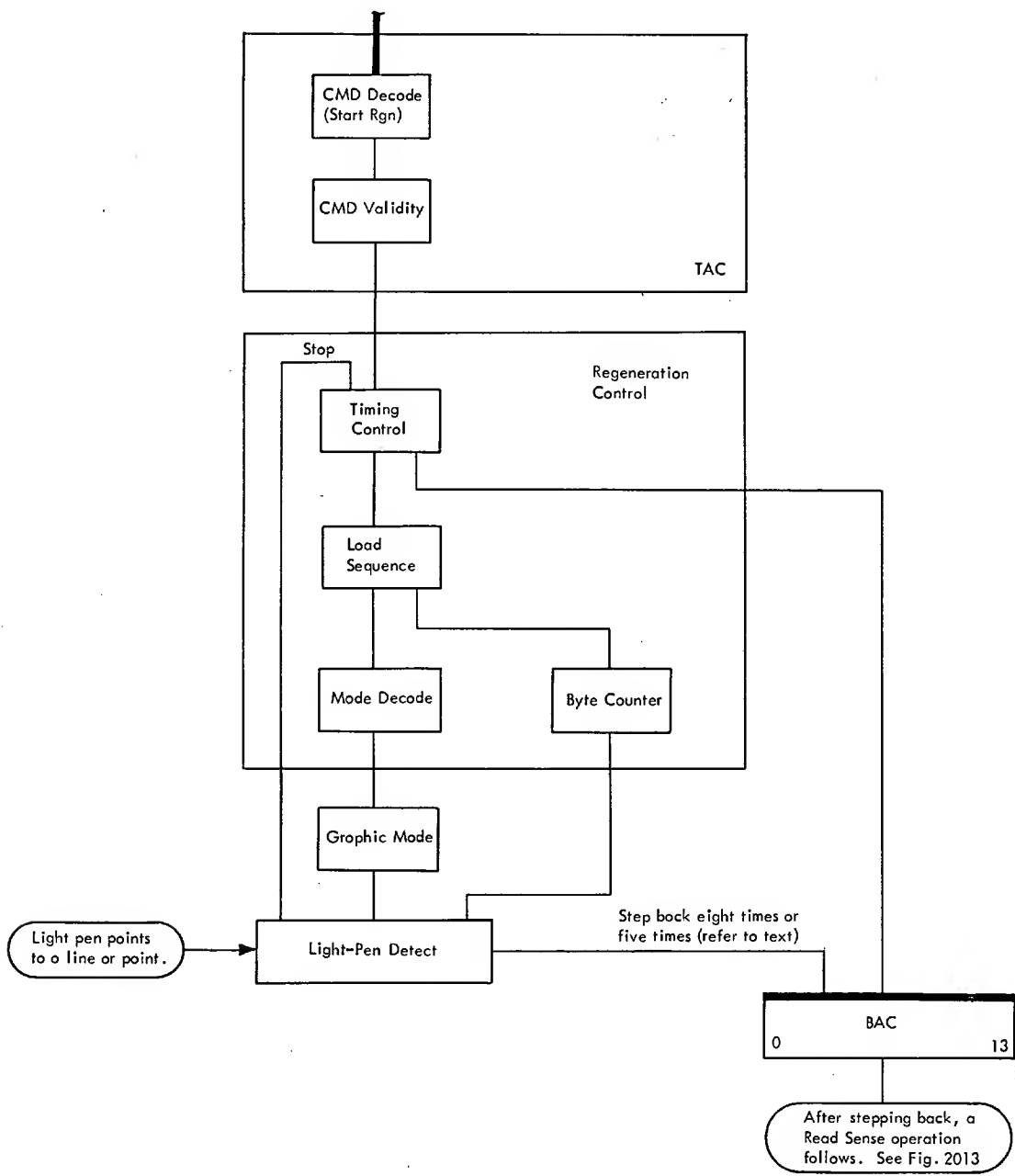
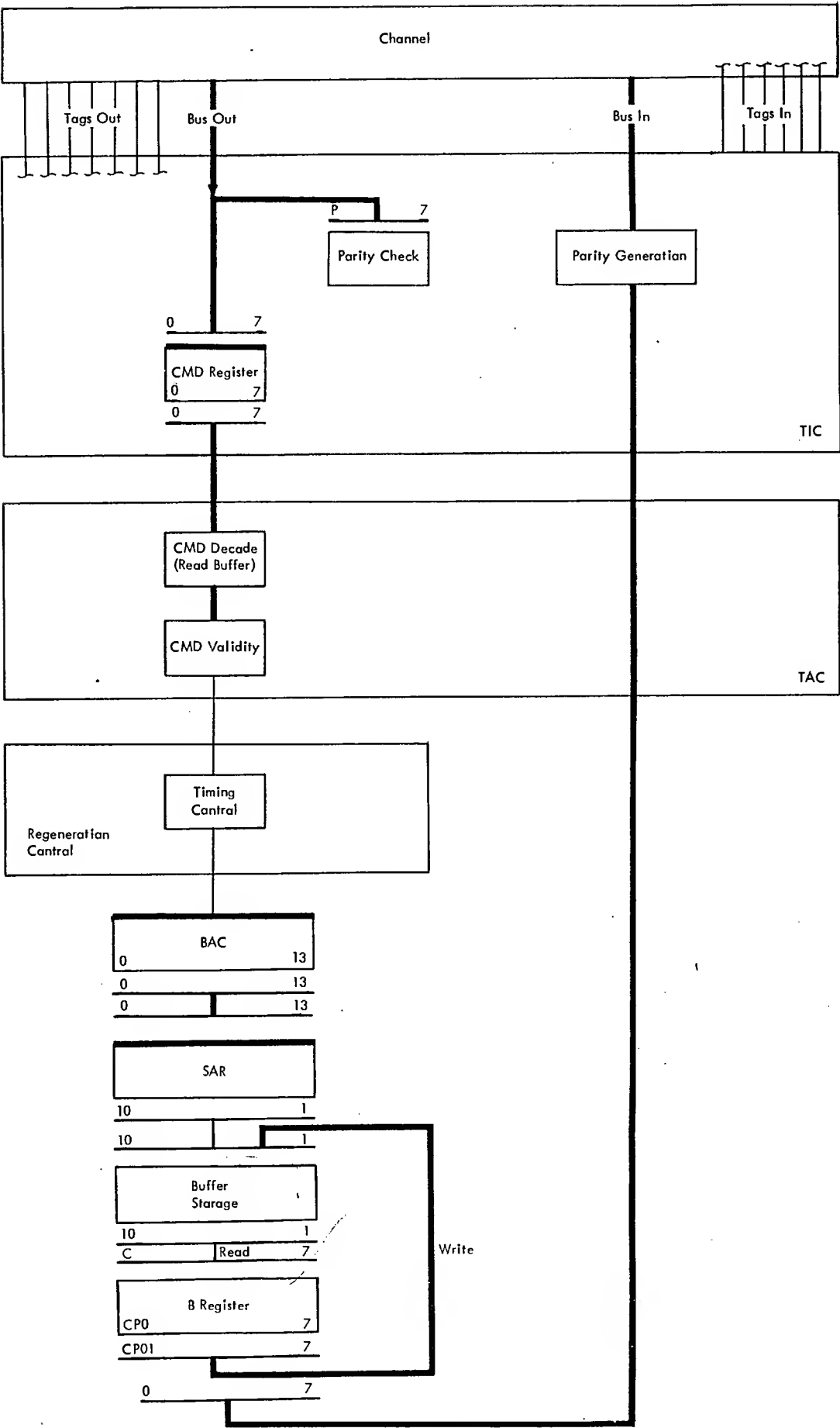


Figure 2010. Light Pen Character Detect, BAC Control



•Figure 2011. Light Pen (Absolute) Graphic Detect, BAC Control



●Figure 2012. Read Buffer Operation

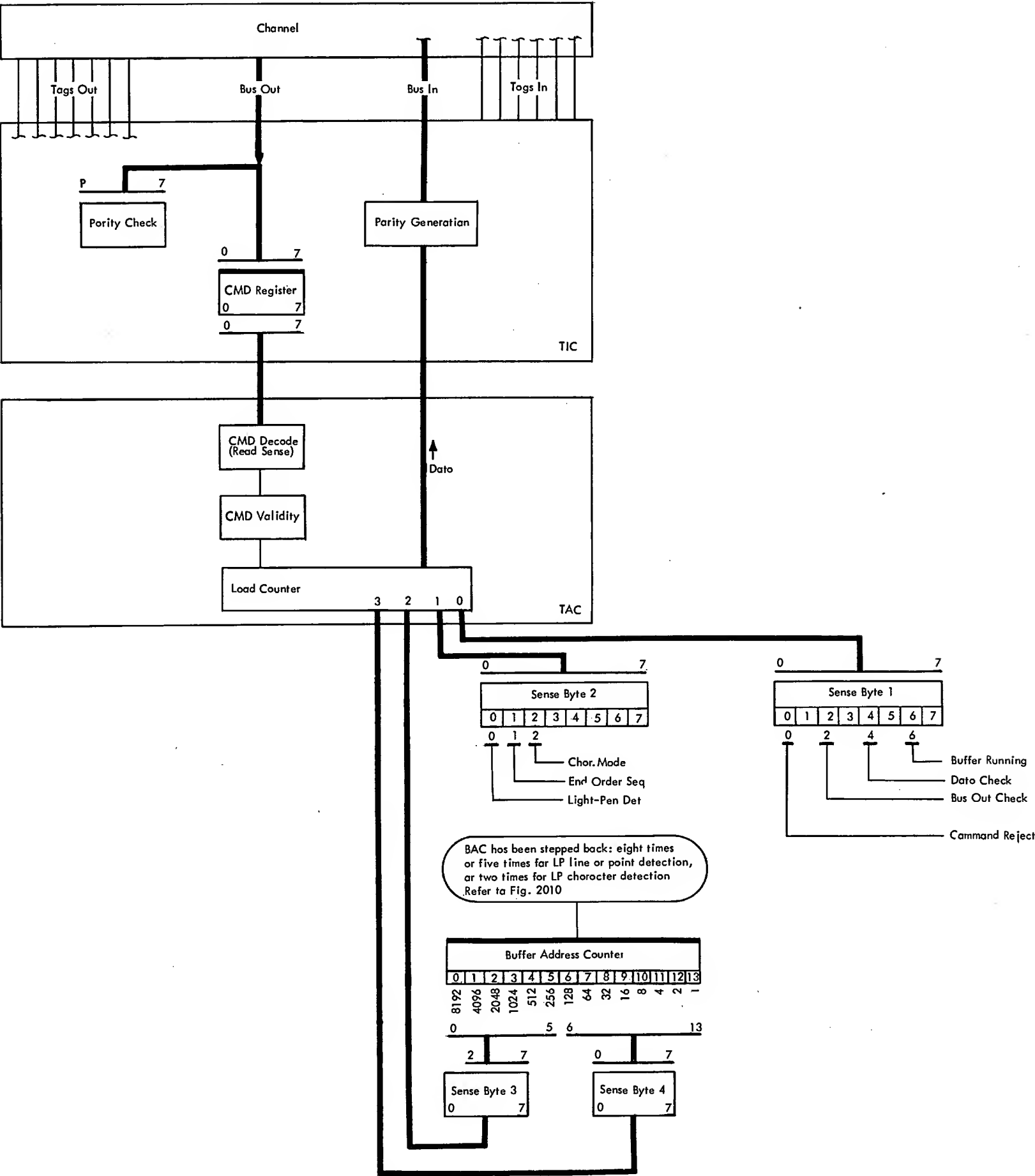


Figure 2013. Read Sense Operation

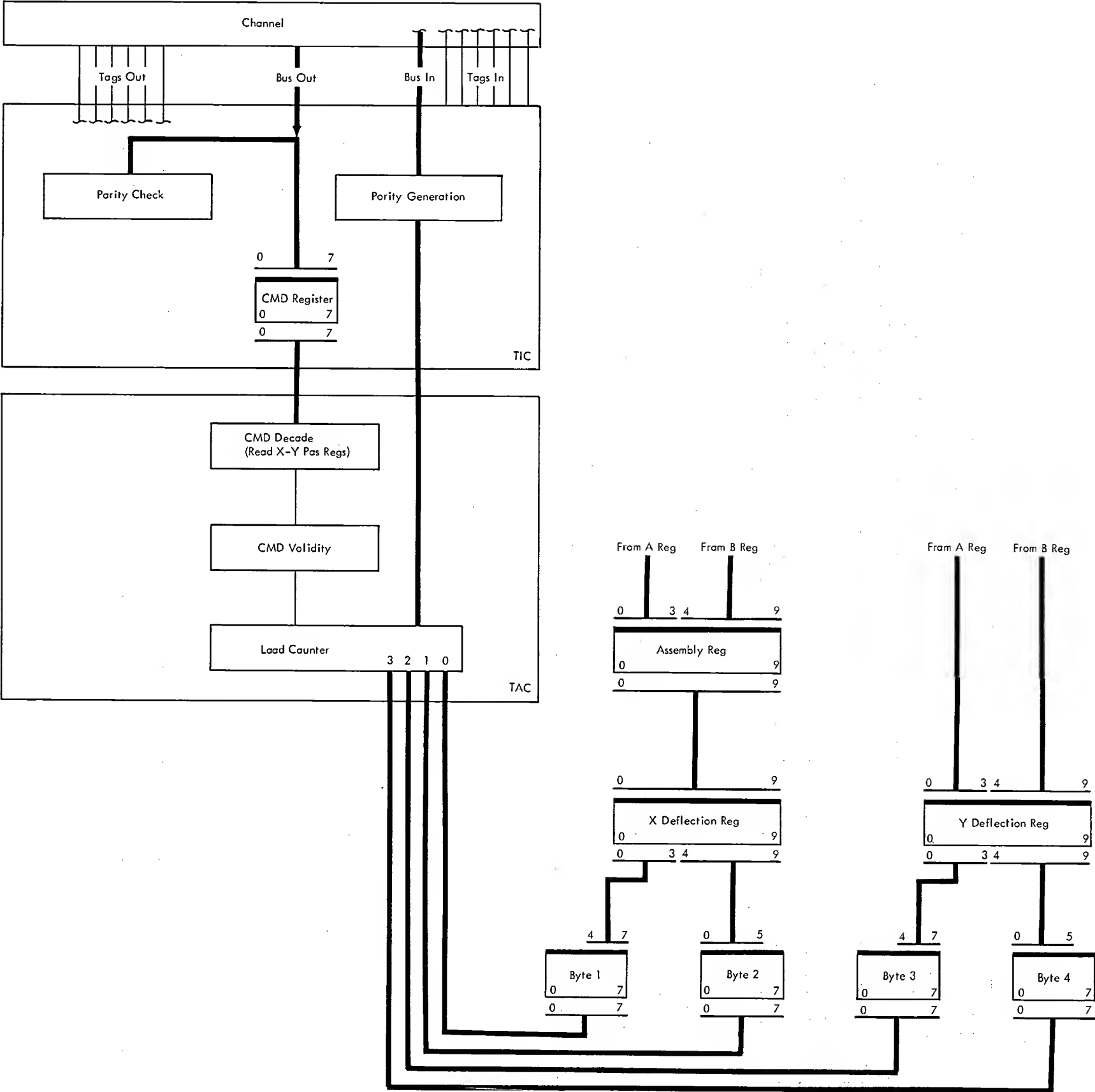


Figure 2014. Read X-Y Position Registers Operation

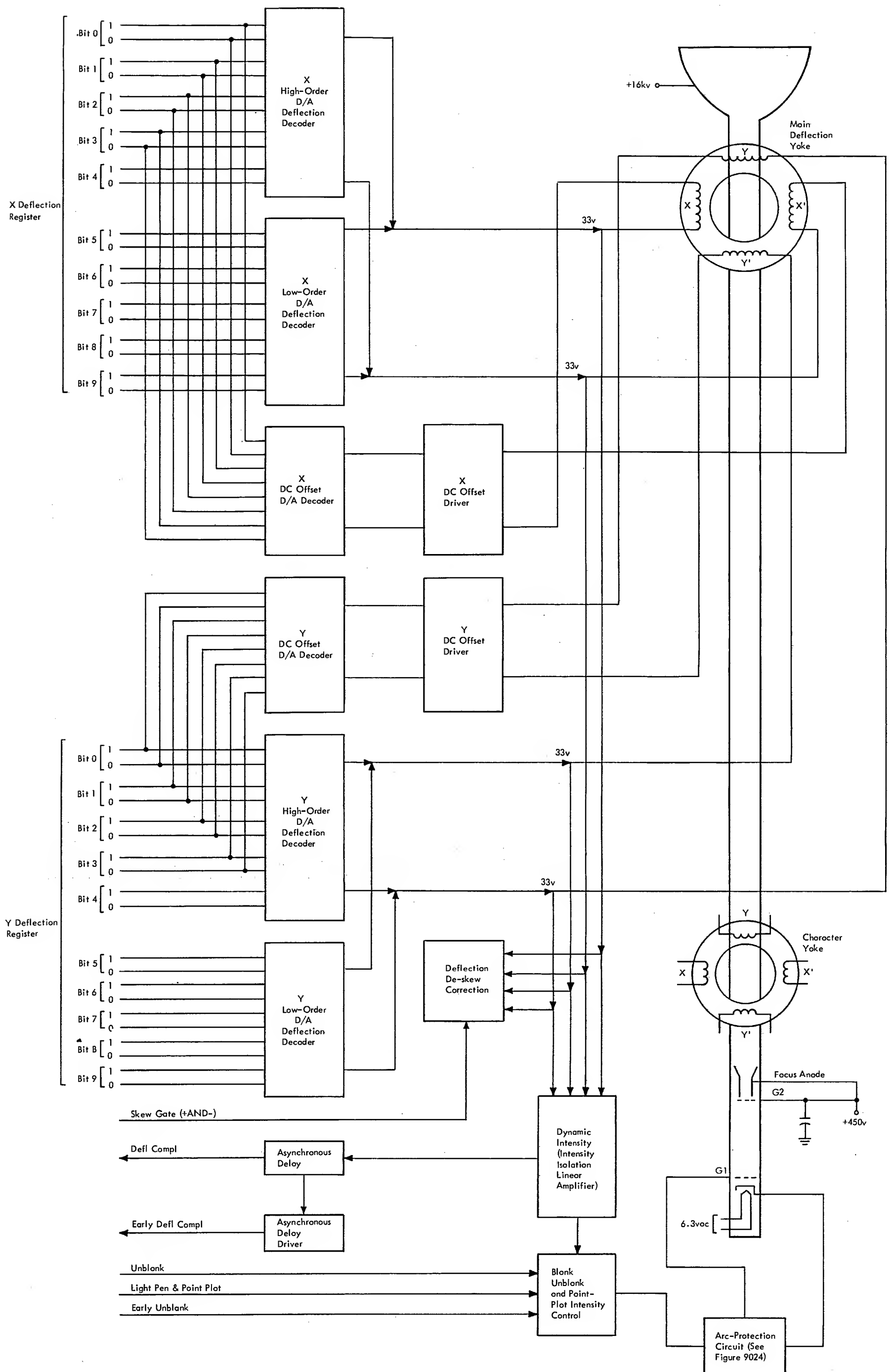


Figure 2015. CRT Beam Deflection and Control, Block Diagram

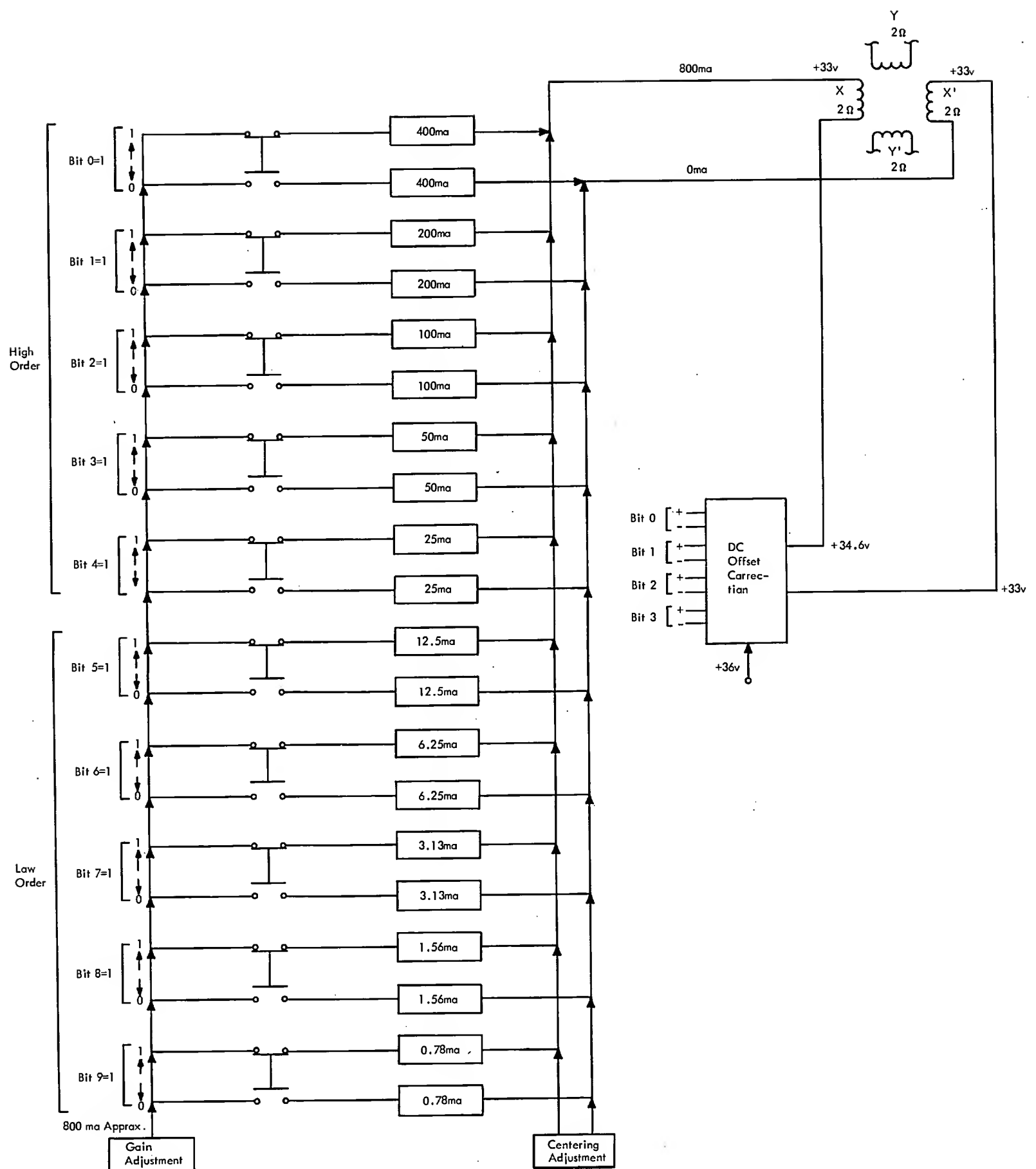
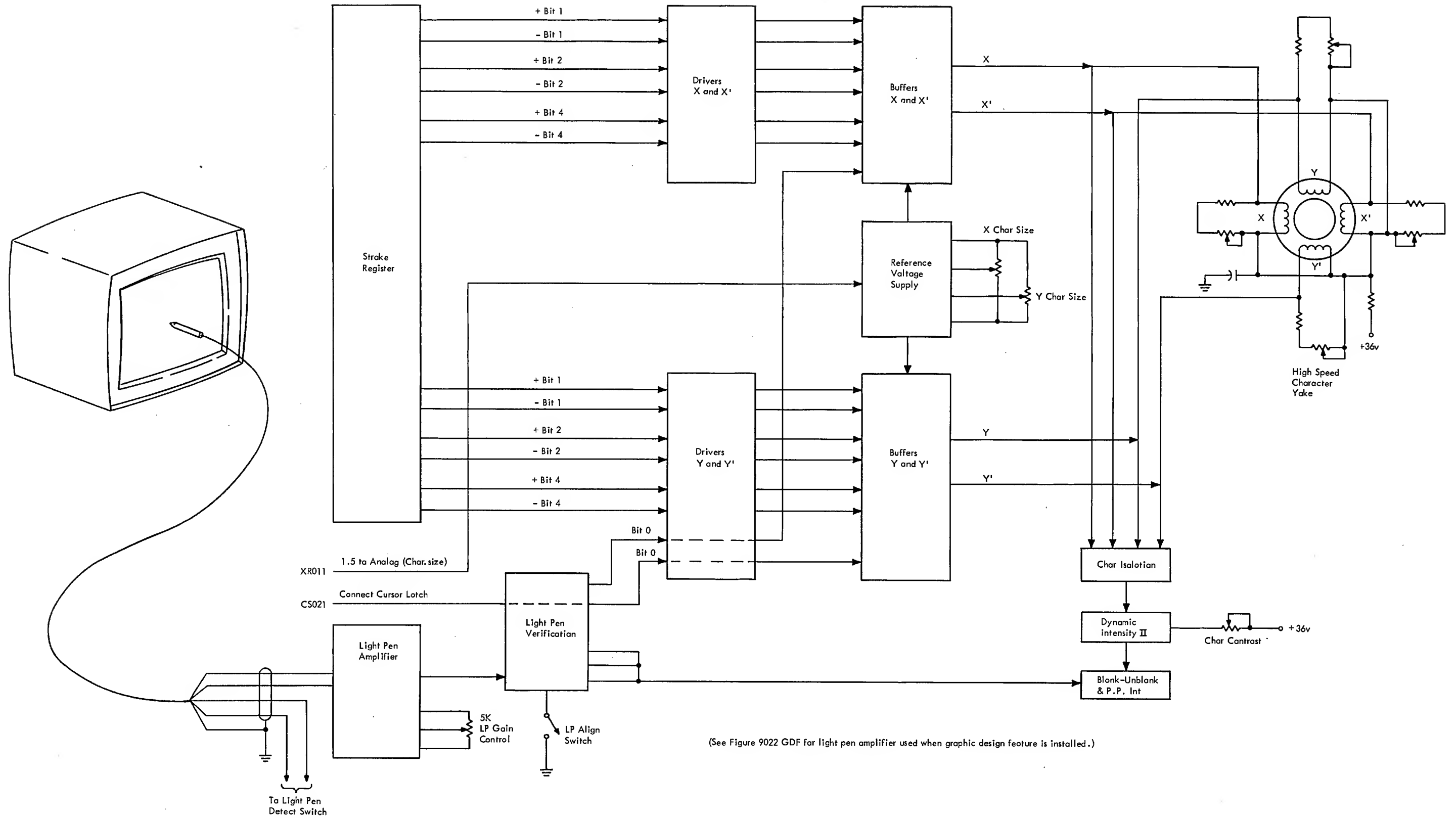
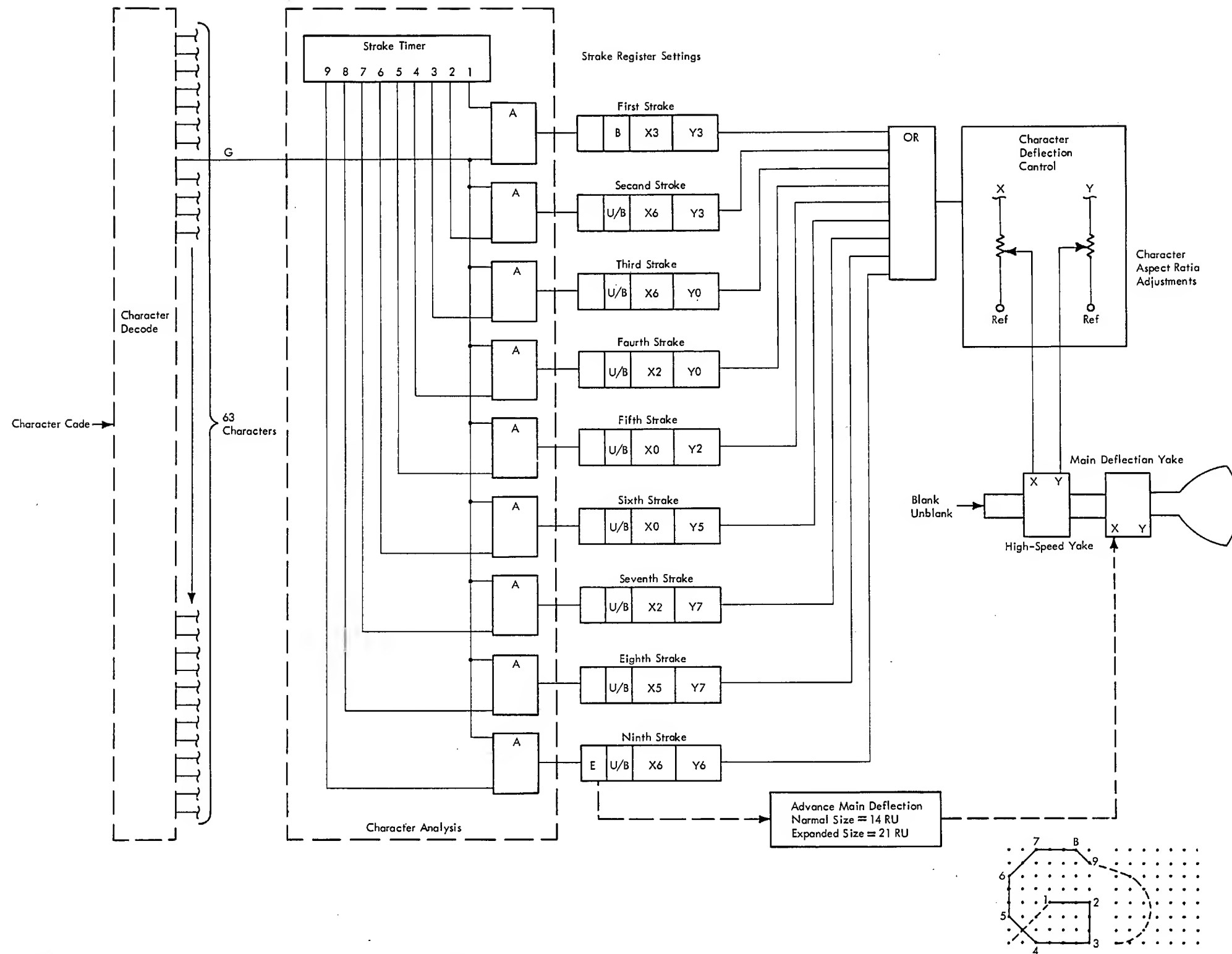


Figure 2016. Yoke Current Distribution, Full X Deflection



•Figure 2017. Character Deflection and Control, Block Diagram



●Figure 5000. Typical Character Generator Operation, Logic Diagram

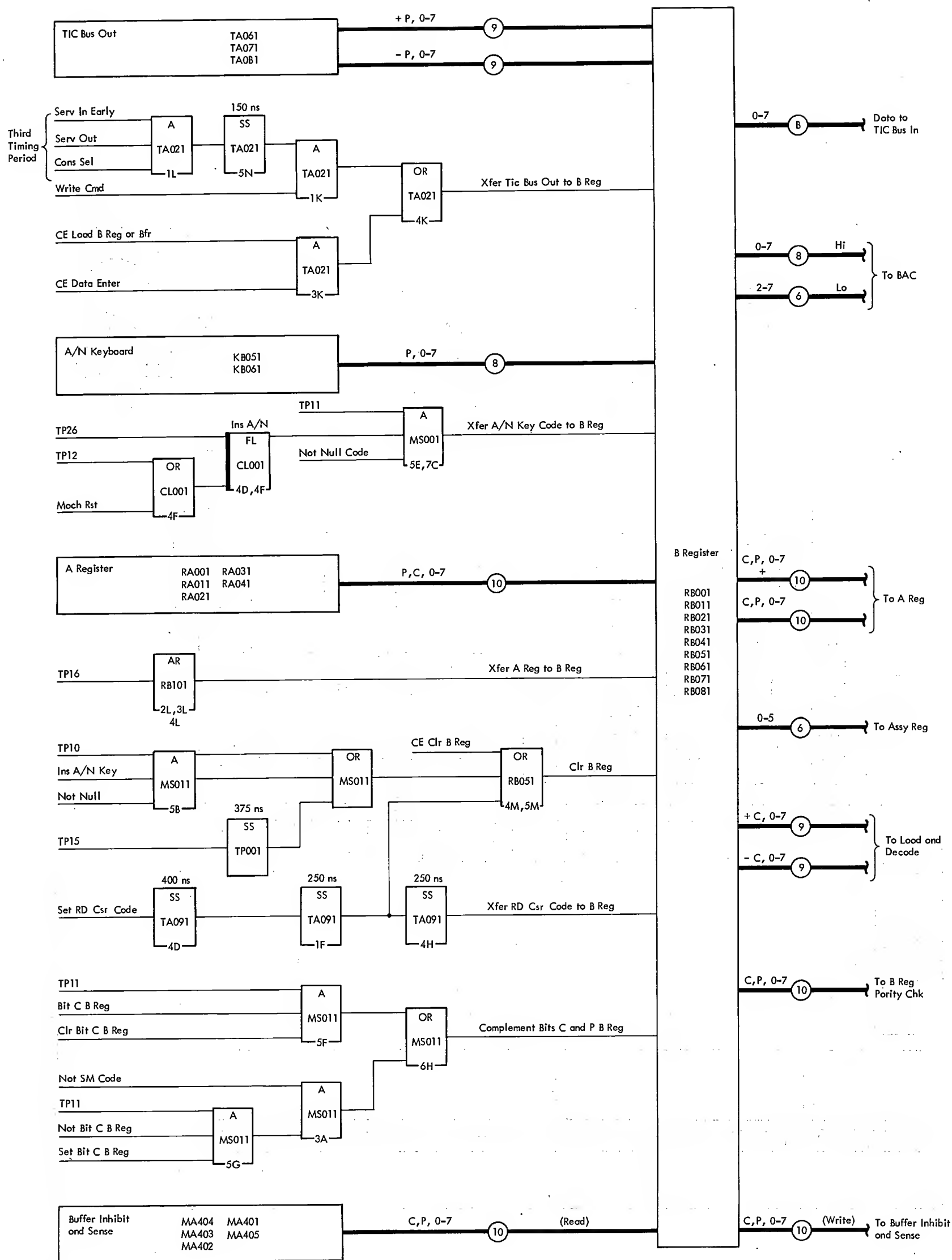


Figure 5001. B Register, Functional Diagram

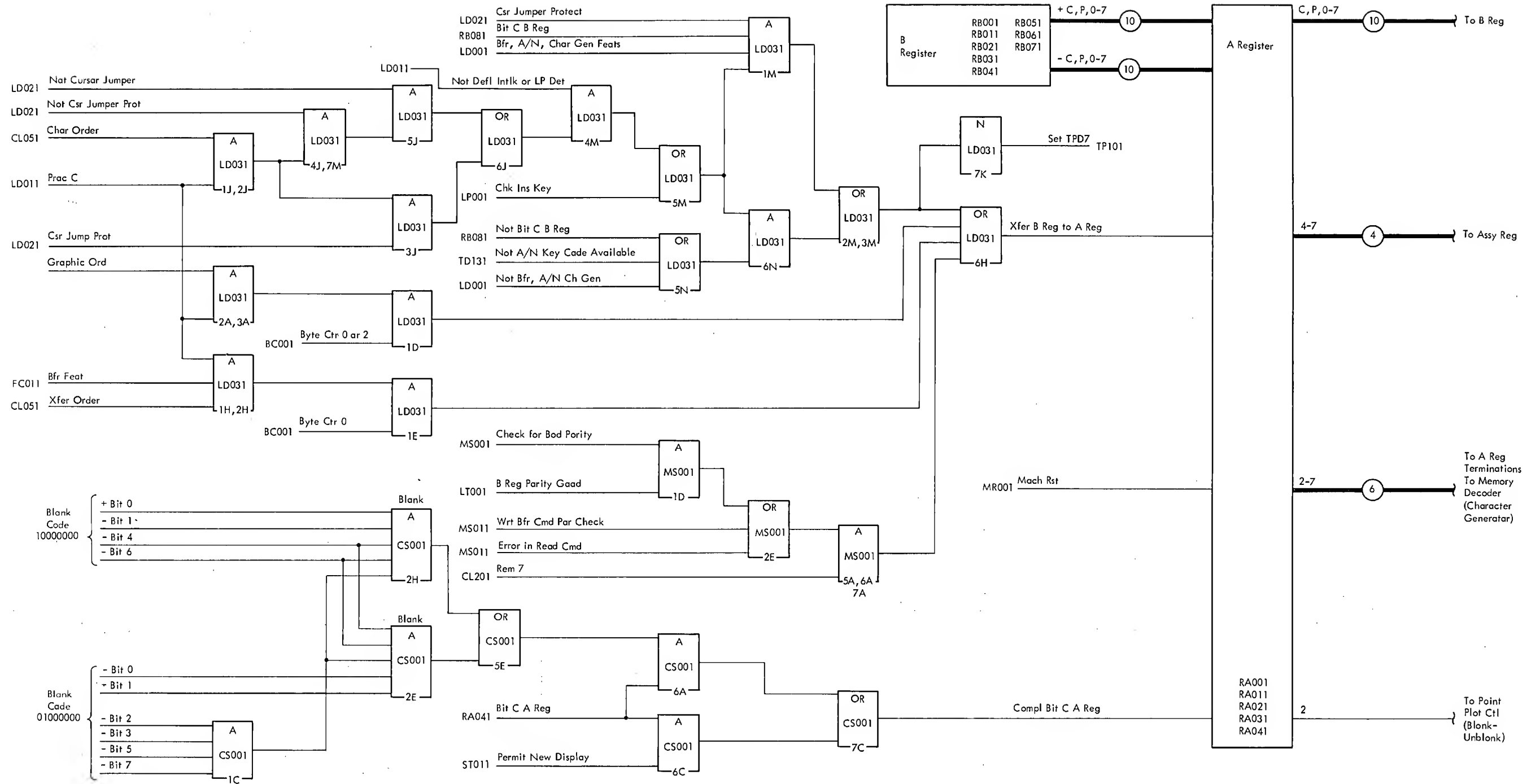


Figure 5002. A Register, Functional Diagram

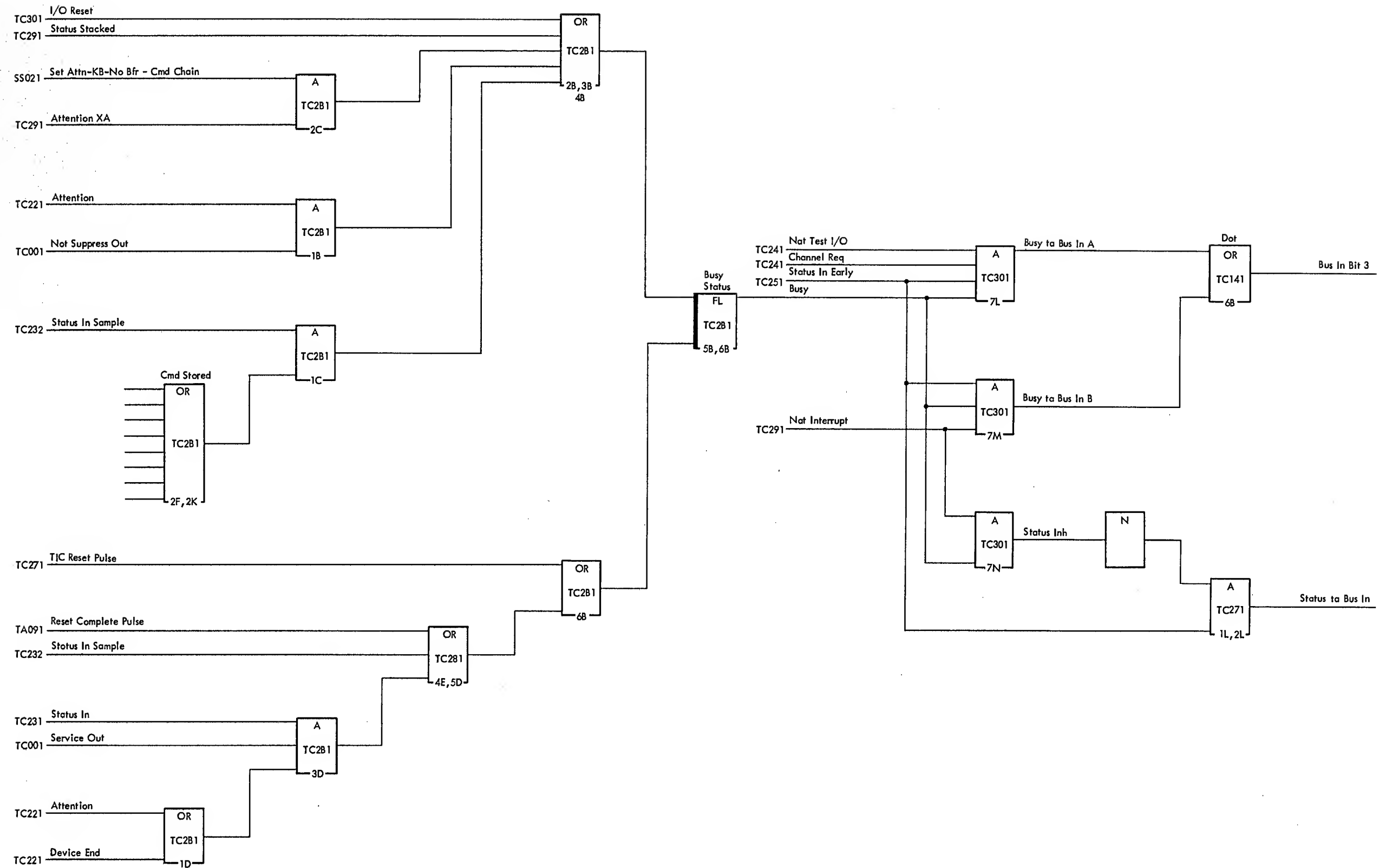


Figure 5003. Status Register, Functional Diagram (Sheet 1 of 2)

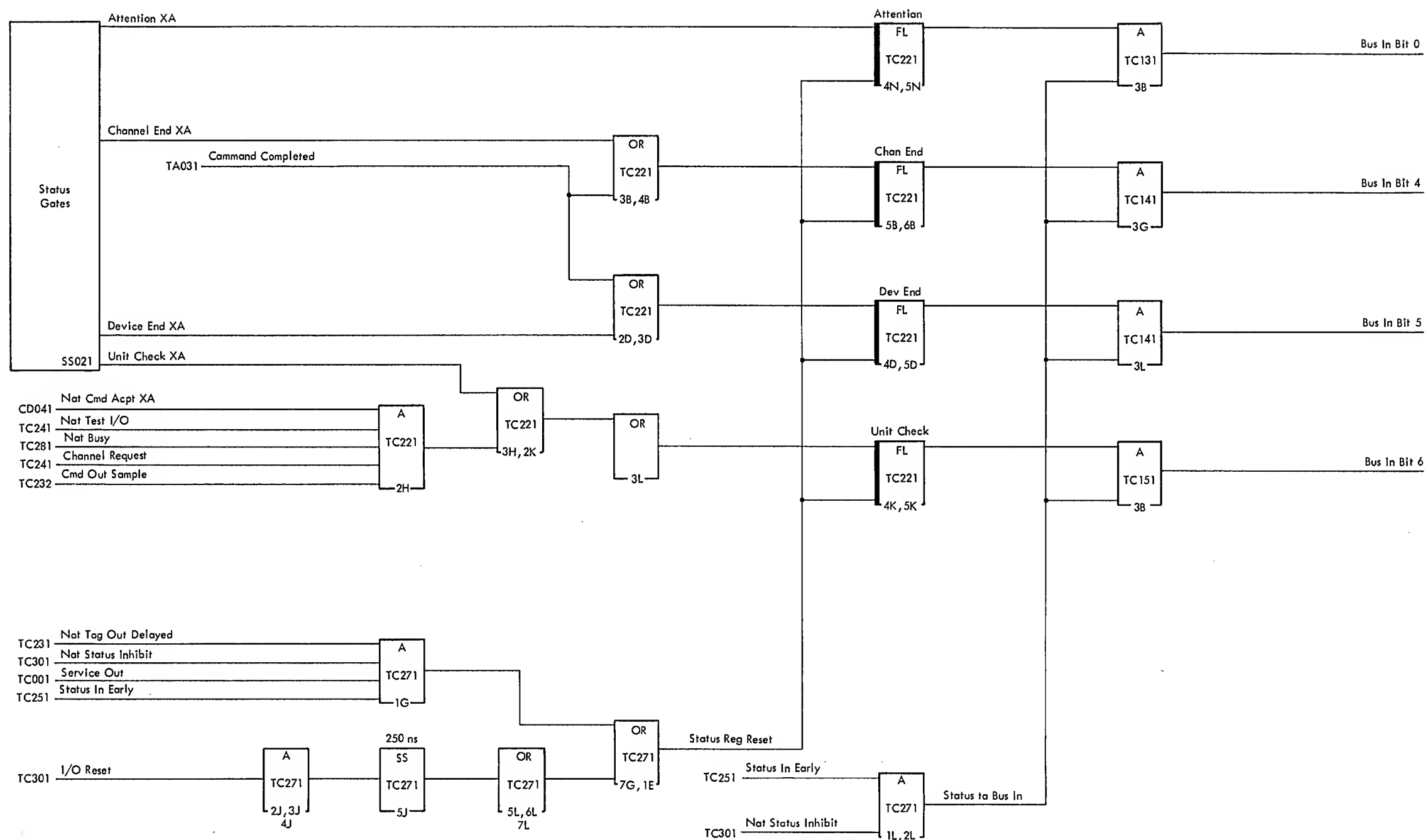


Figure 5003. Status Register, Functional Diagram (Sheet 2 of 2)

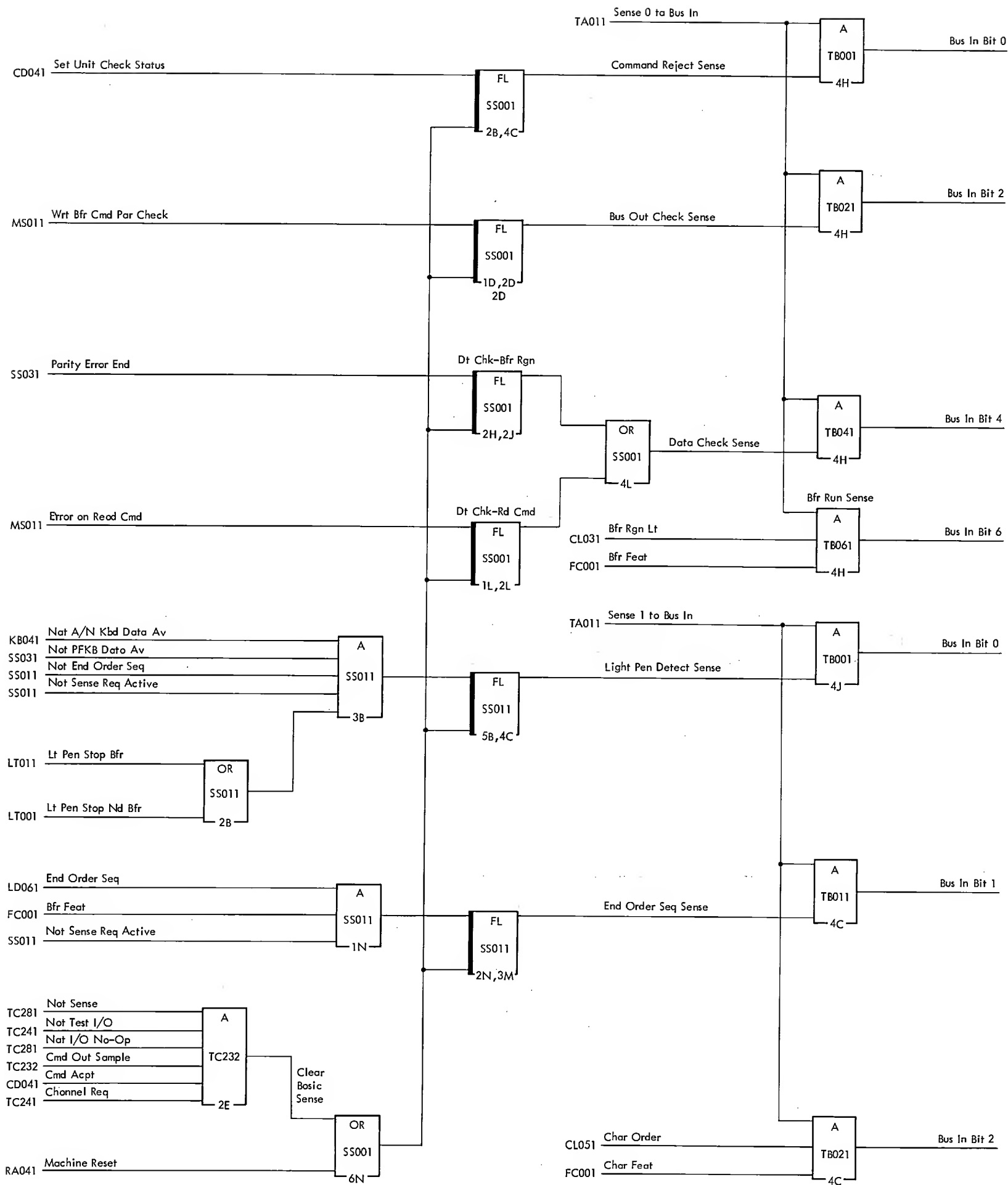


Figure 5004. Sense Register, Bytes 1 and 2, Functional Diagram

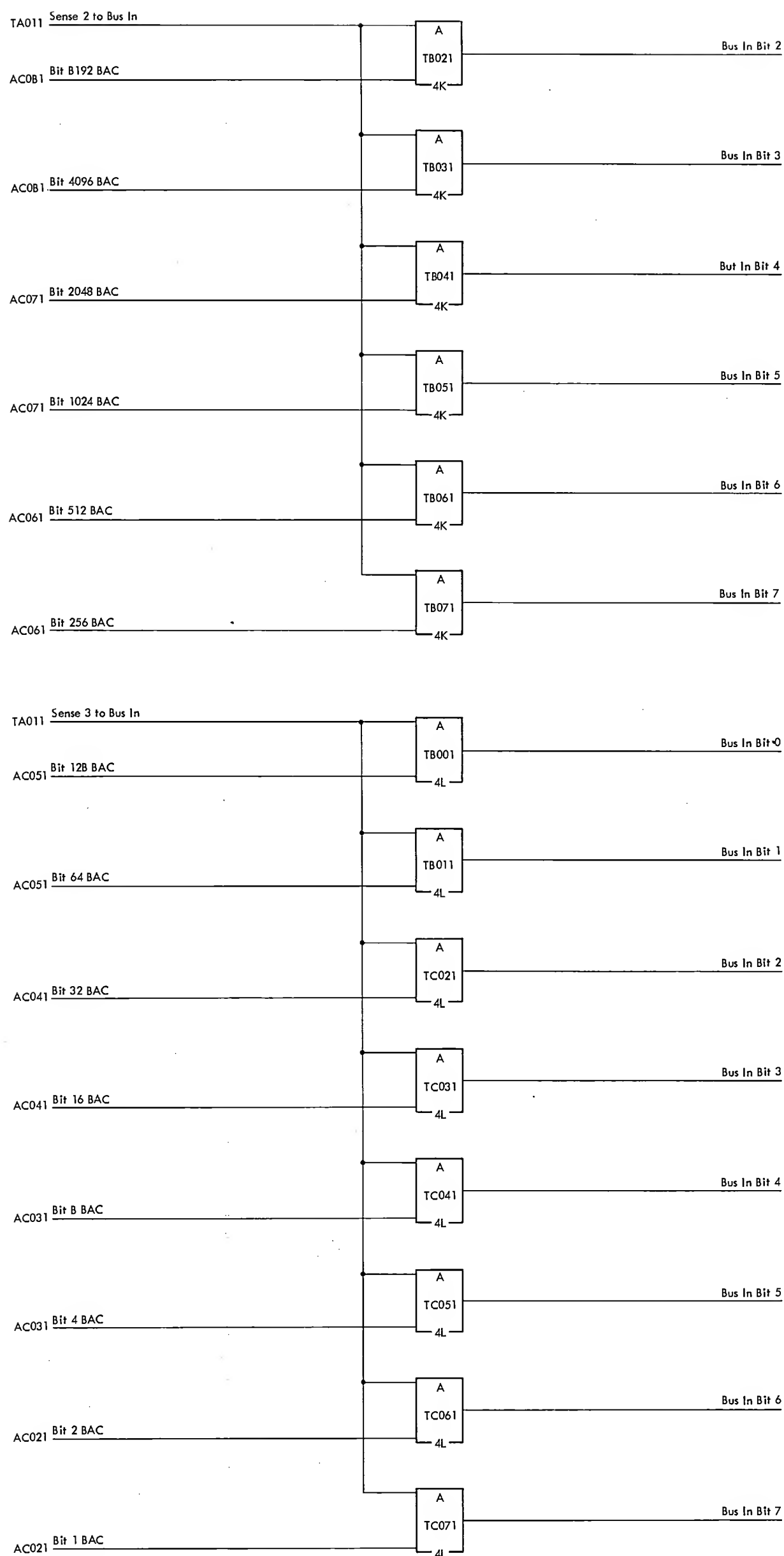


Figure 5005. Sense Register, Bytes 3 and 4, Functional Diagram

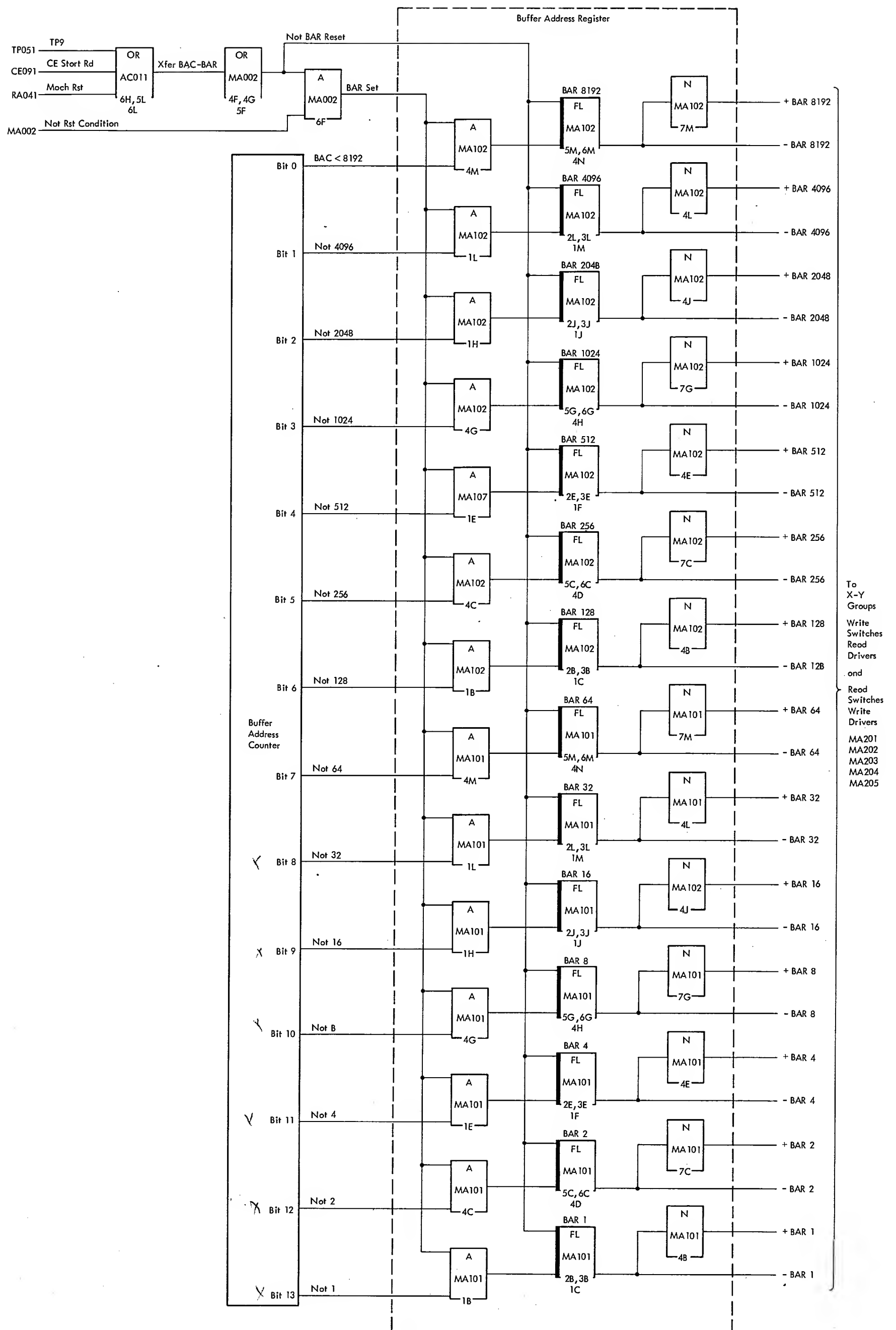


Figure 5006. Buffer Address Register, Functional Diagram

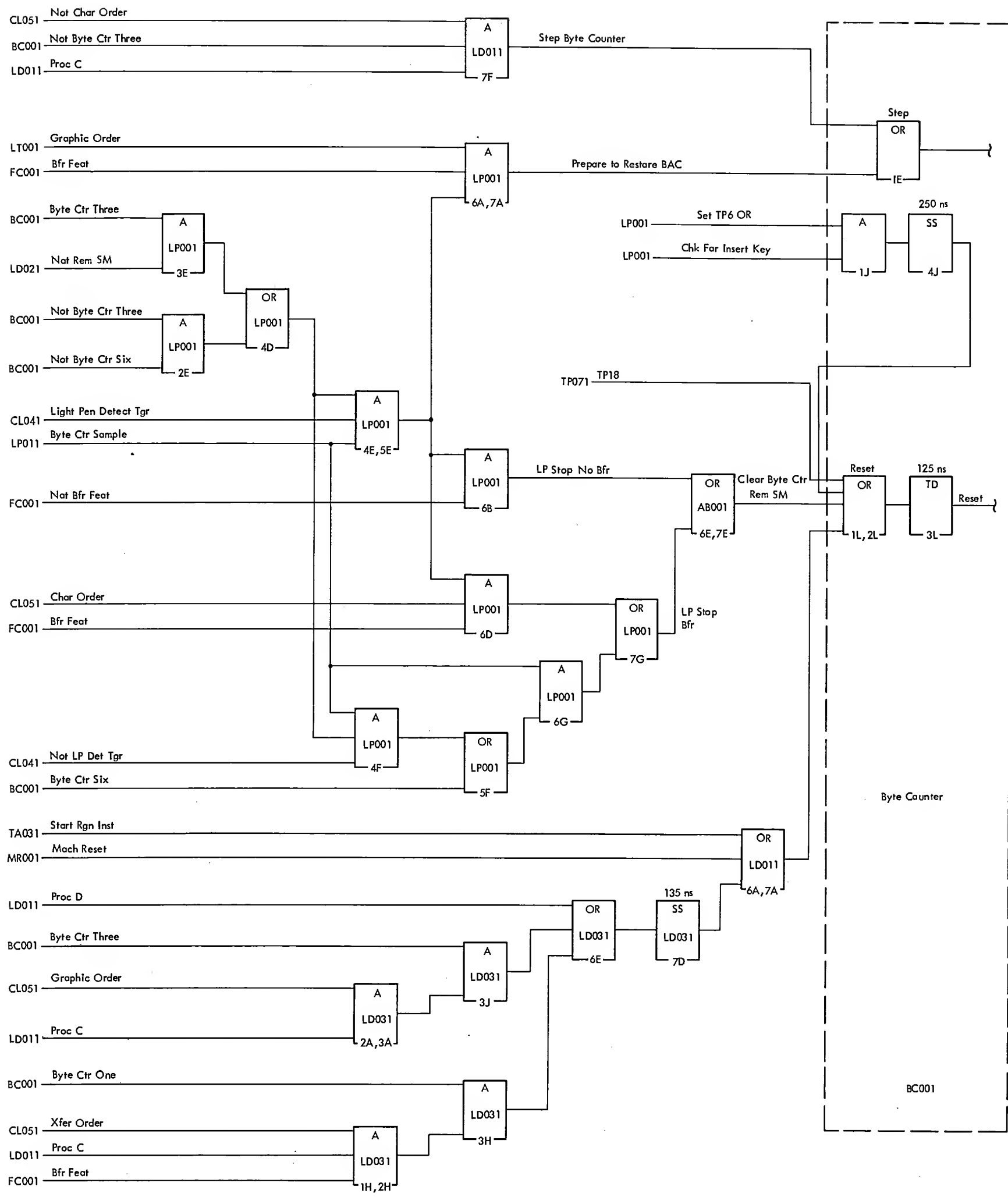


Figure 5007. Byte Counter, Functional Diagram

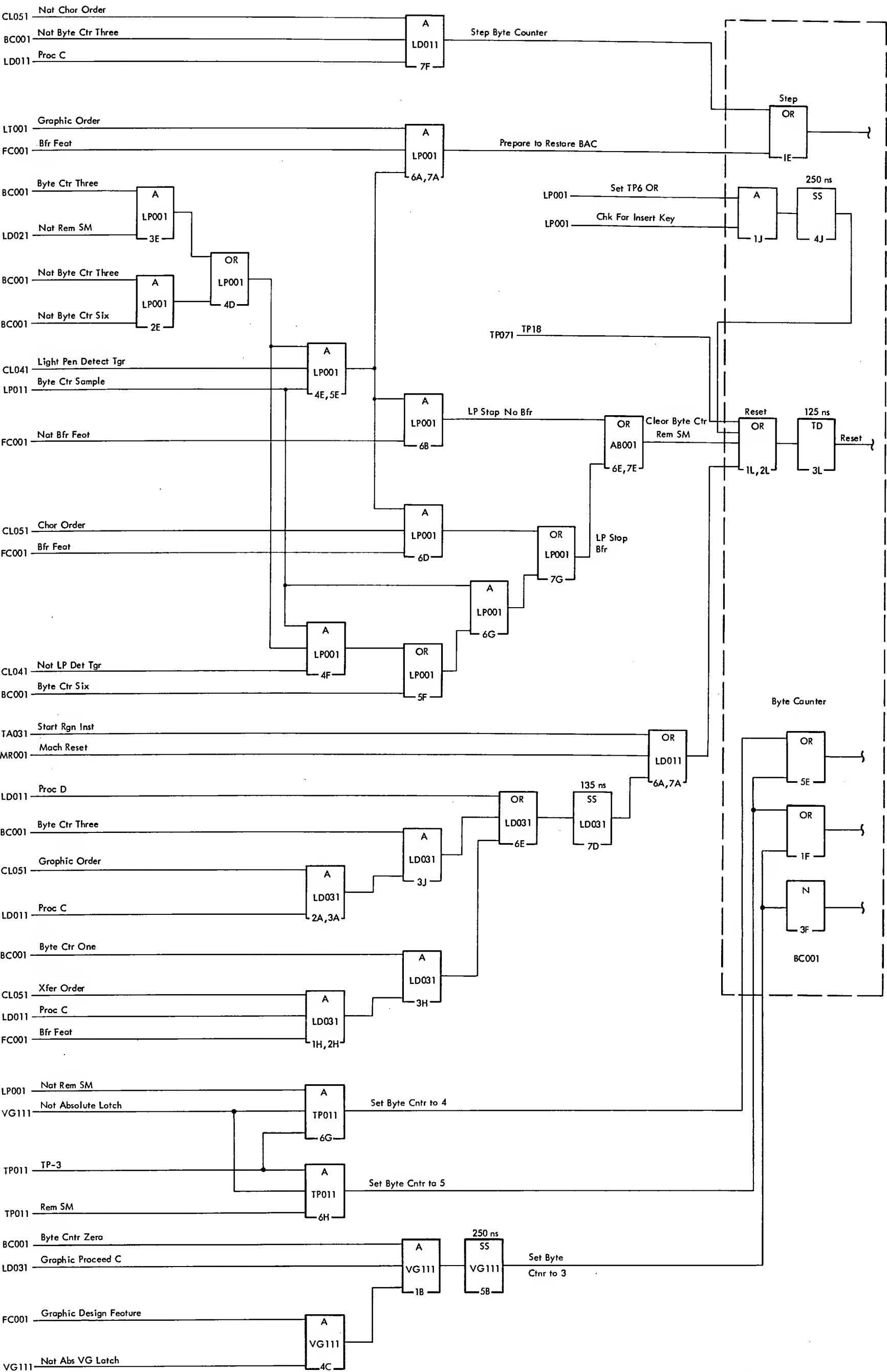


Figure 5007GDF. Byte Counter, Functional Diagram (for GDF Machines)

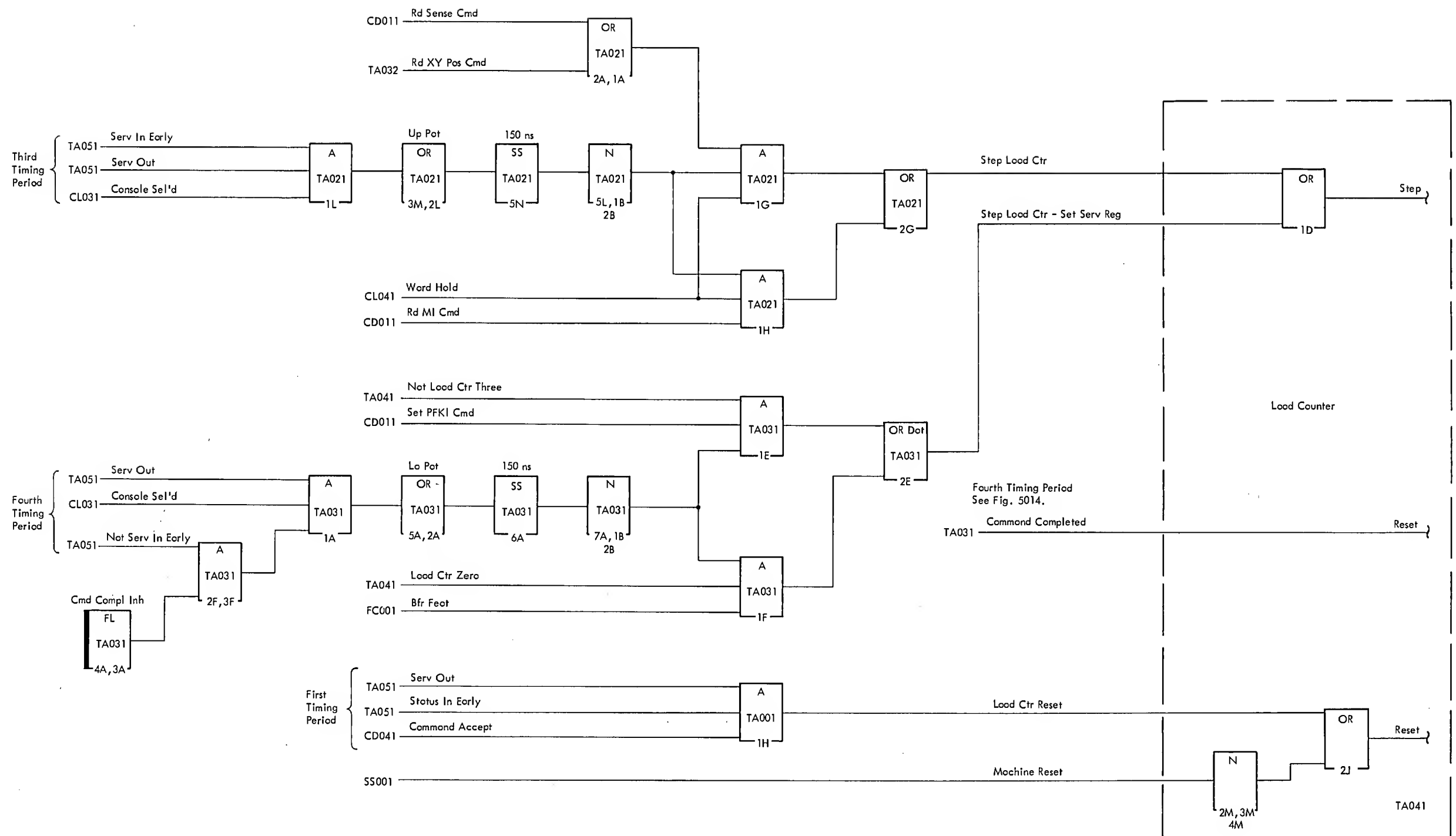


Figure 5008. Load Counter, Functional Diagram

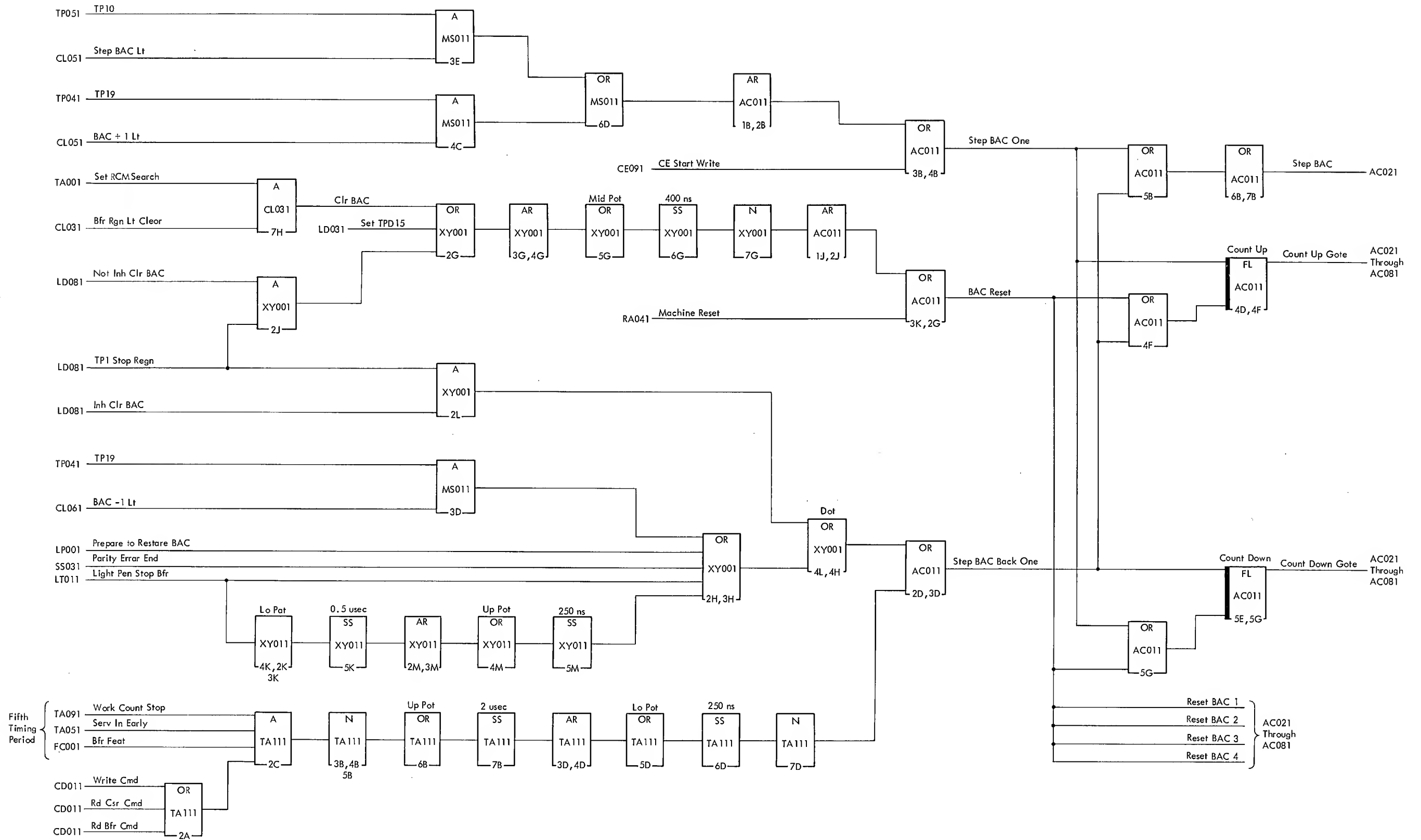


Figure 5009. Buffer Address Counter, Functional Diagram (Sheet 1 of 2)

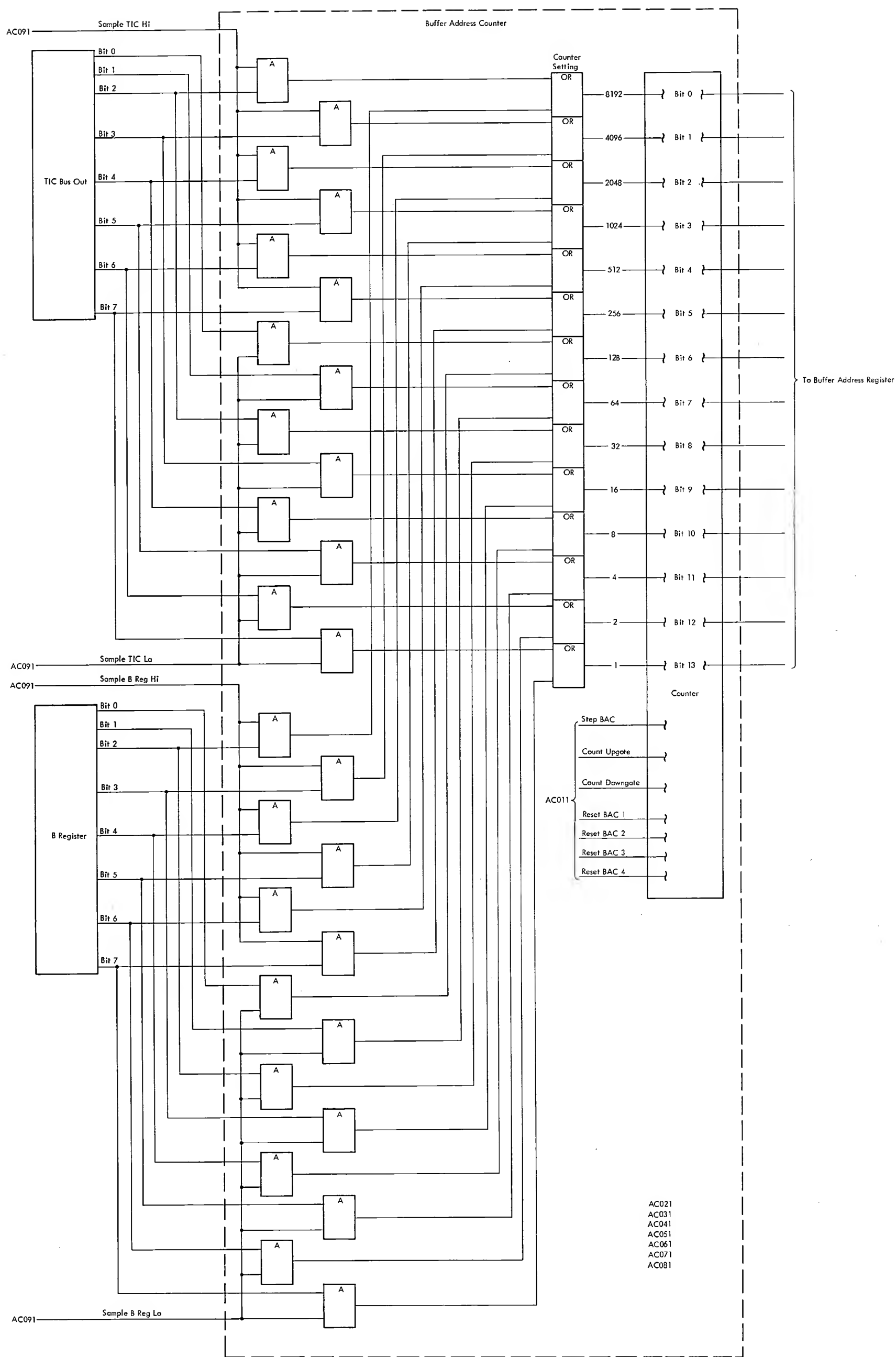


Figure 5009. Buffer Address Counter, Functional Diagram (Sheet 2 of 2)

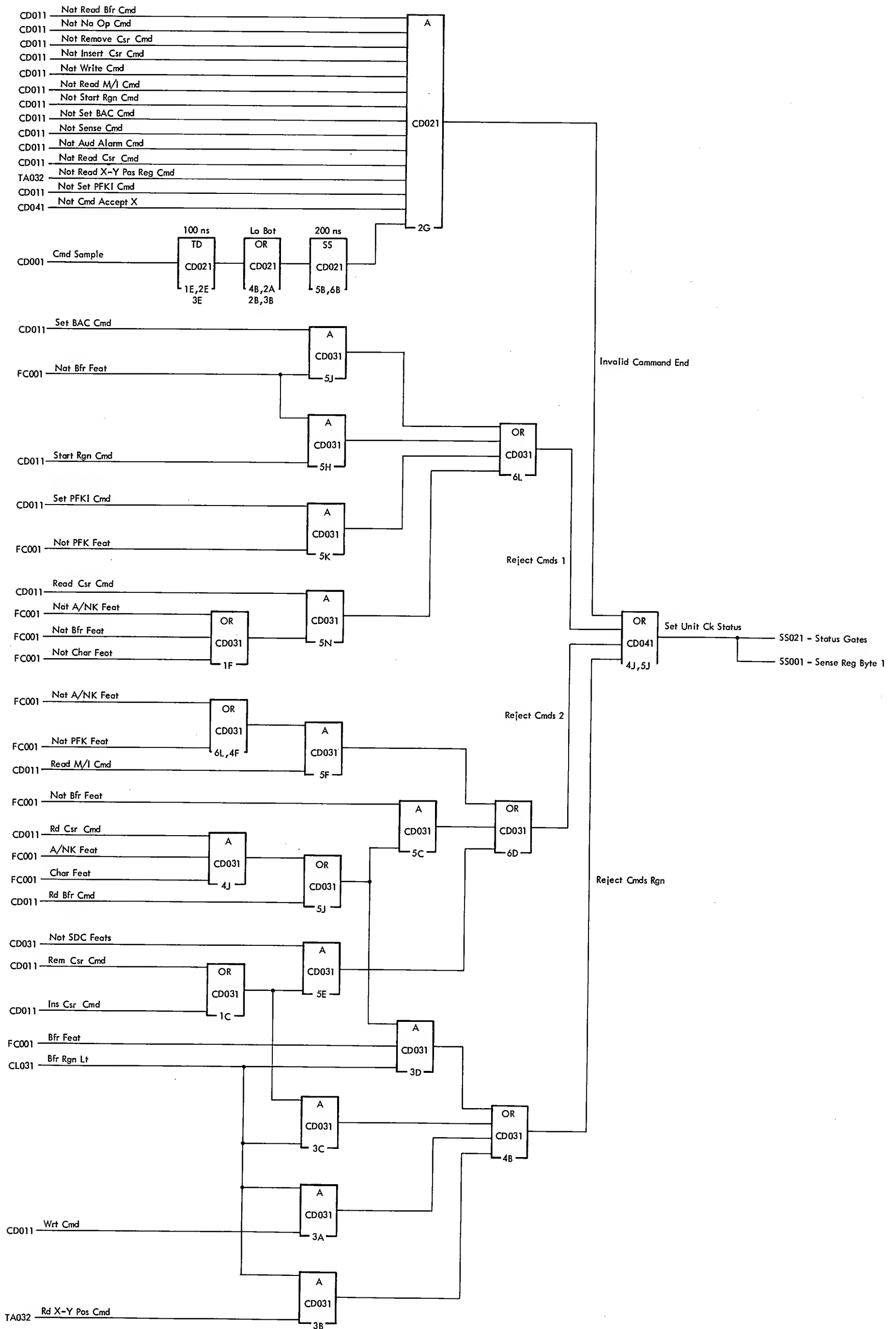


Figure S010. Command Validation, Functional Diagram (Sheet 1 of 2)

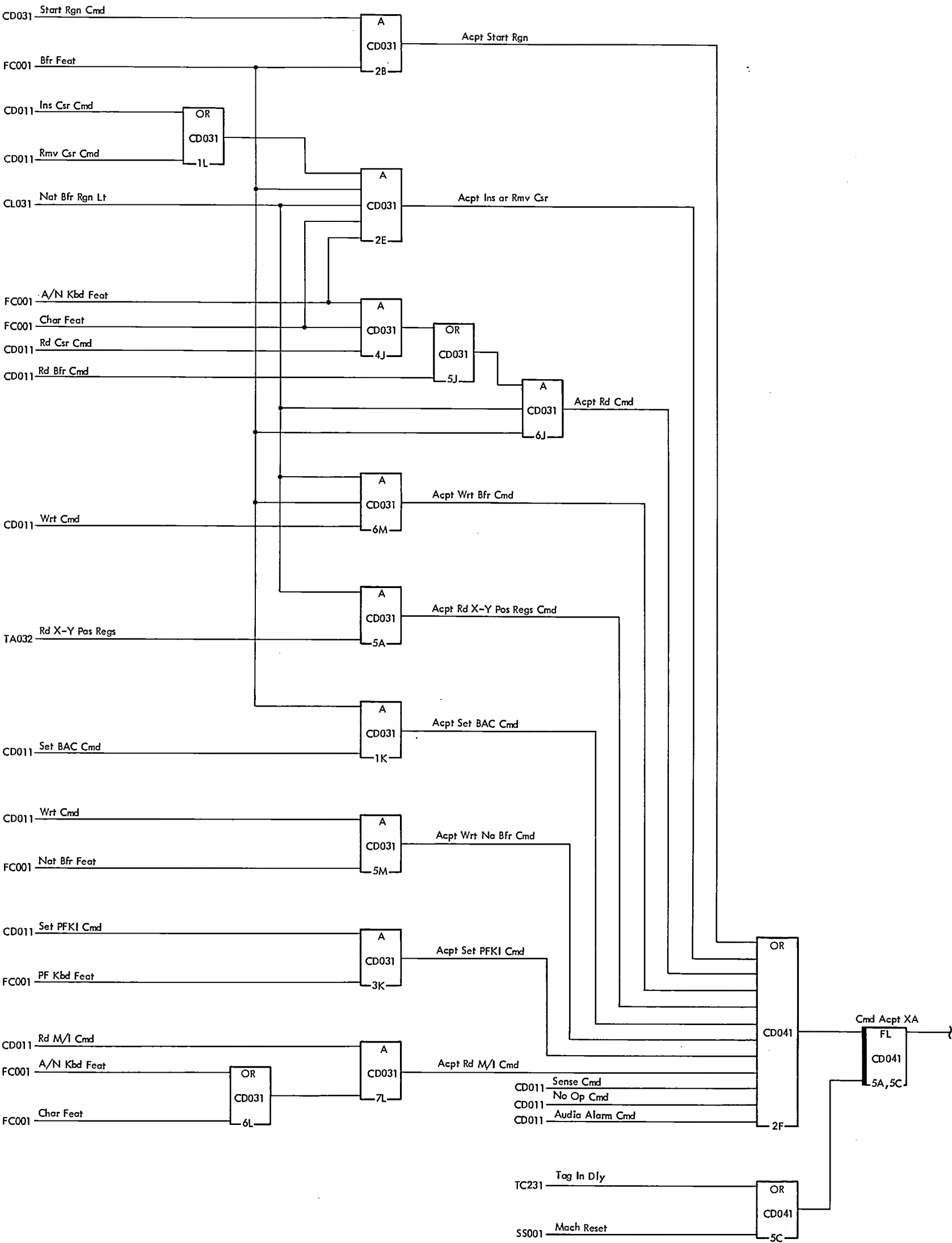


Figure 5010. Command Validation, Functional Diagram (Sheet 2 of 2)

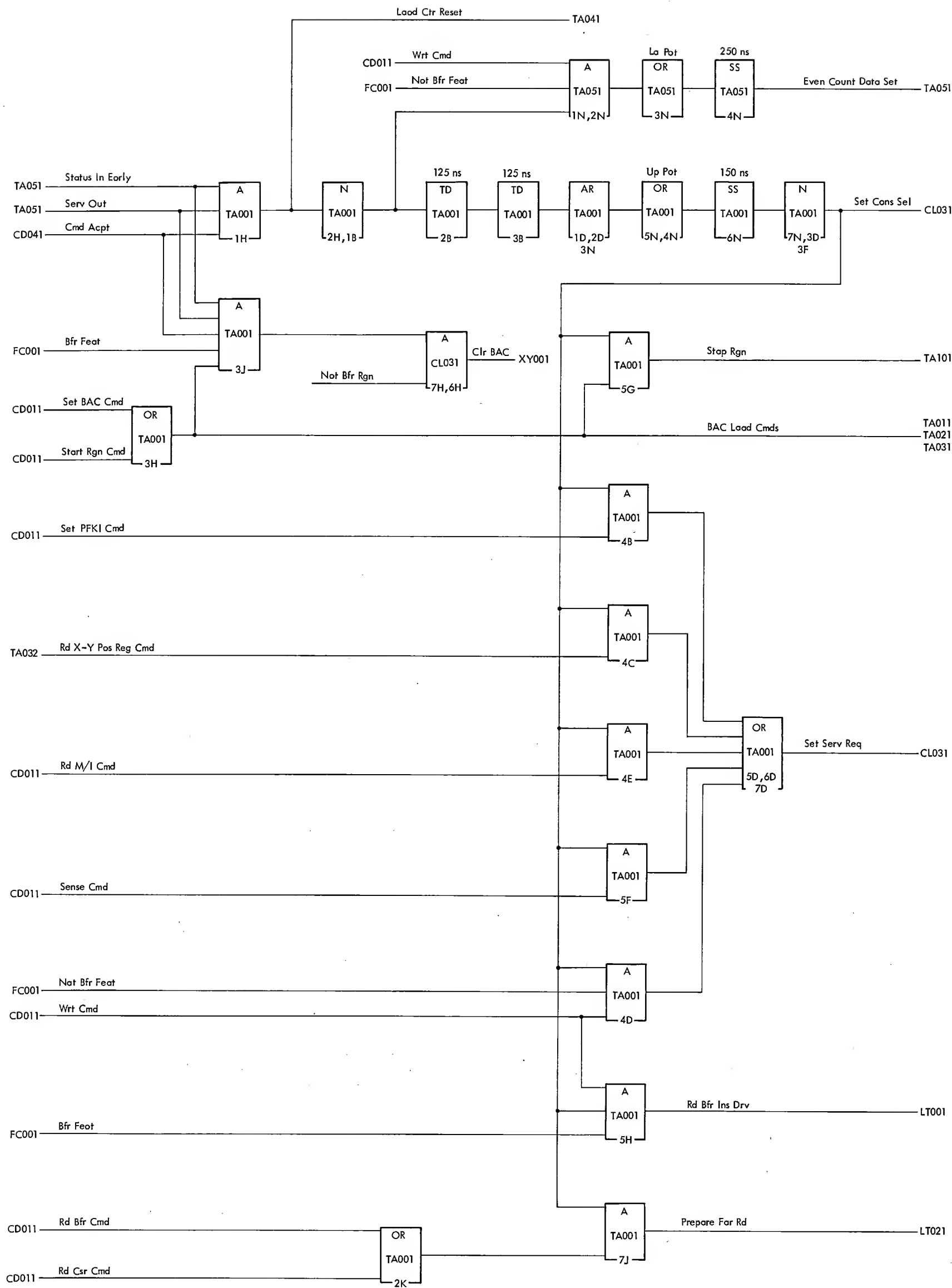


Figure 5011. First Timing Period, Functional Diagram

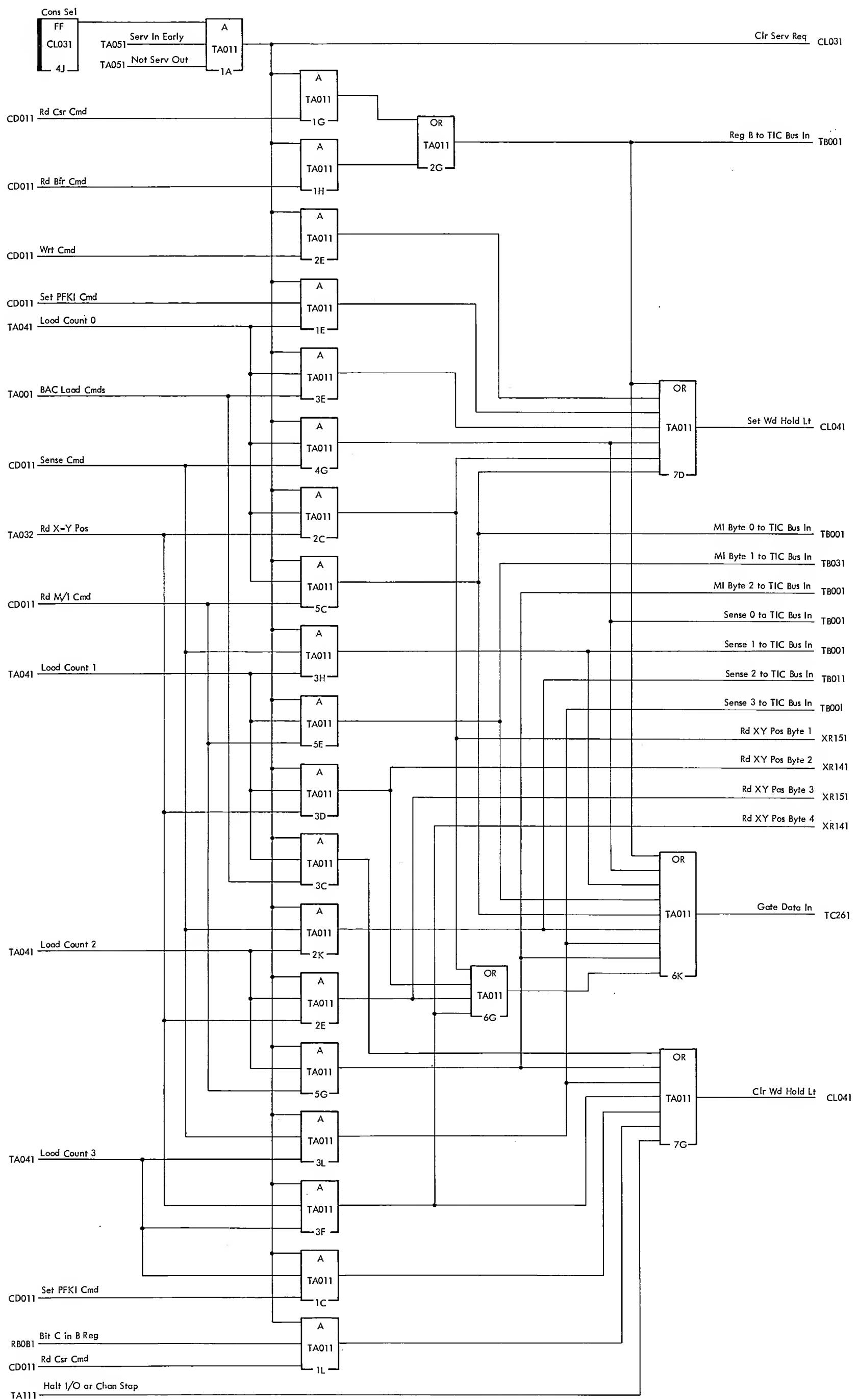


Figure 5012. Second Timing Period, Functional Diagram

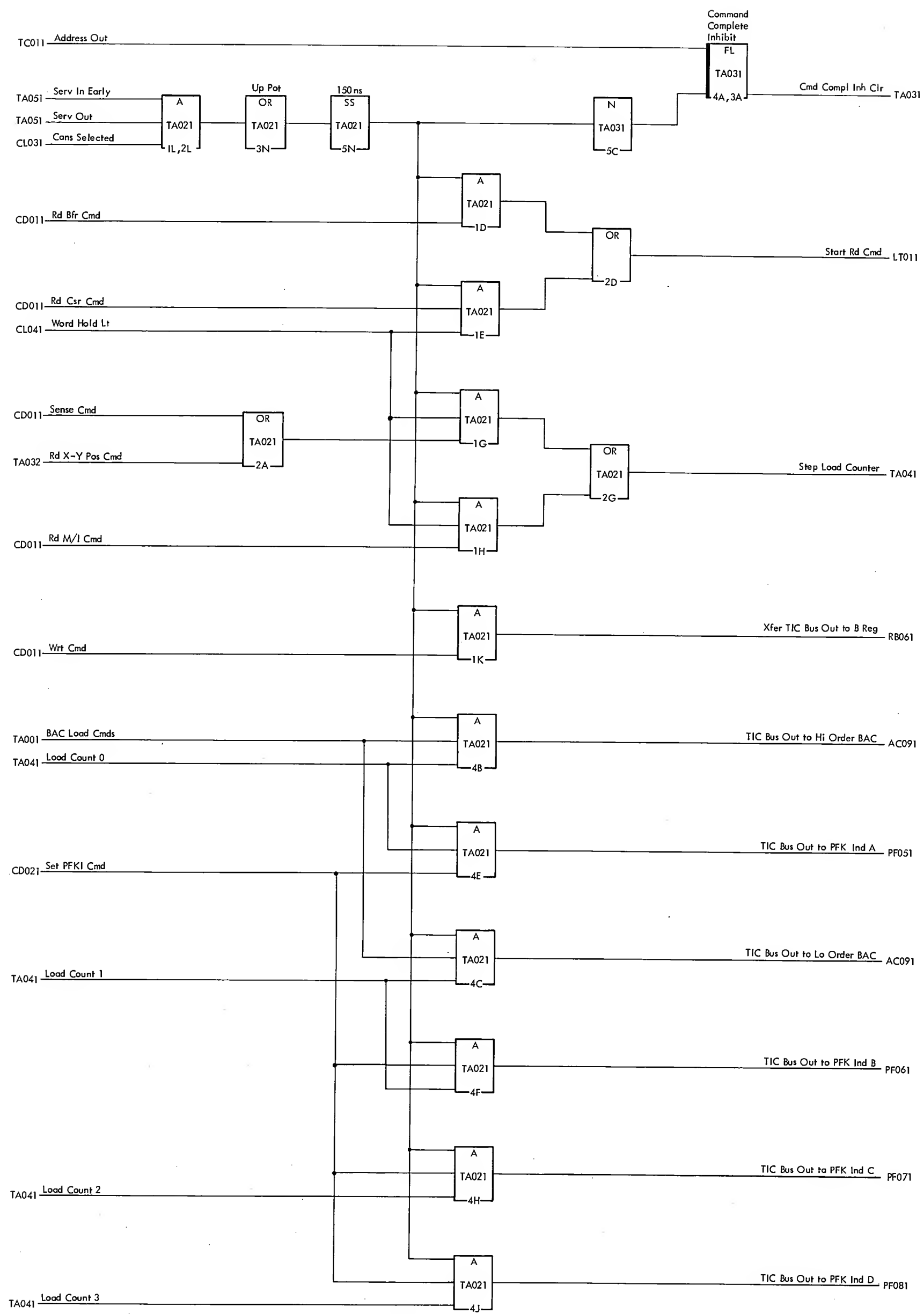


Figure 5013. Third Timing Period, Functional Diagram

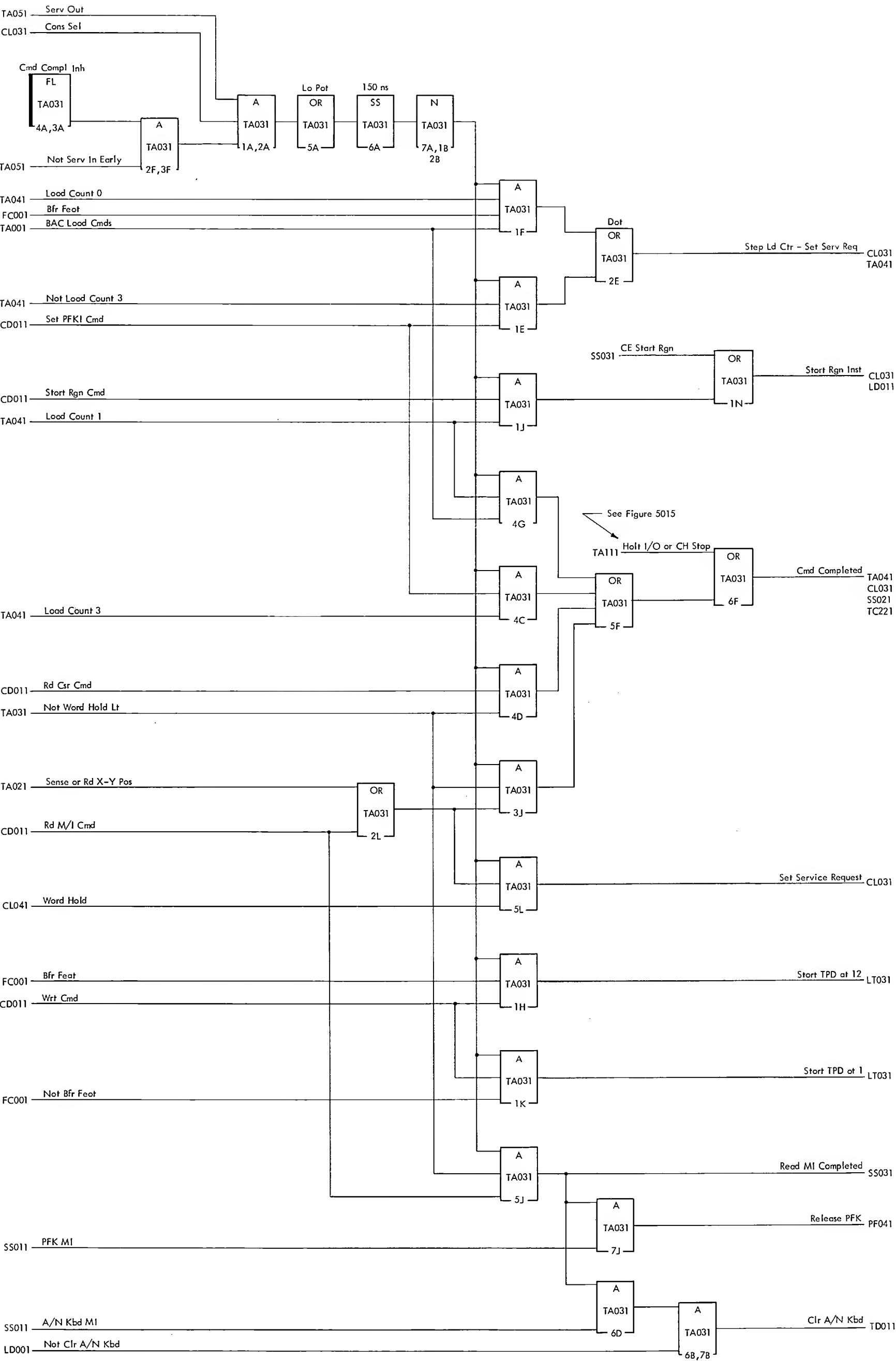


Figure 5014. Fourth Timing Period, Functional Diagram

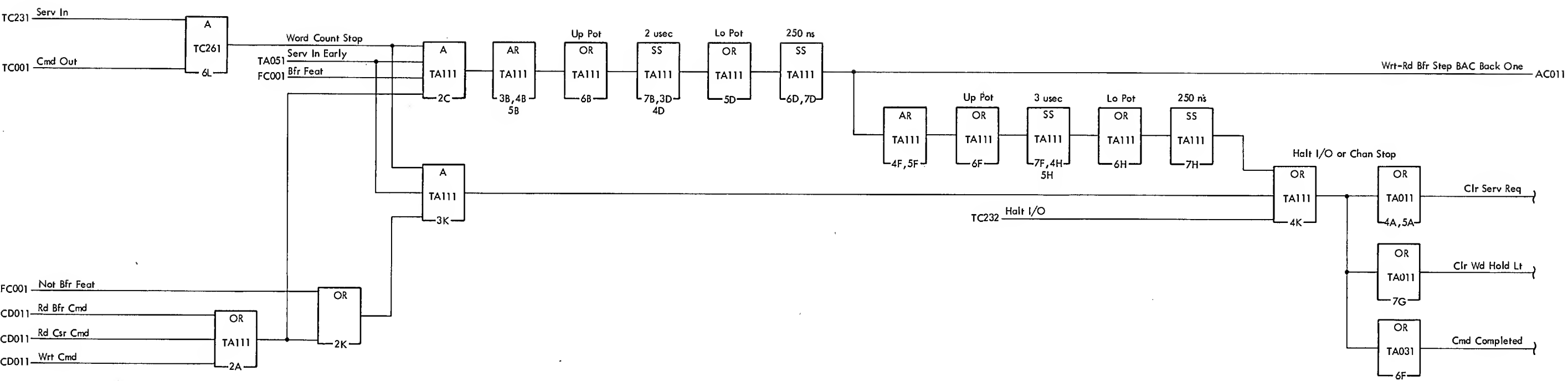


Figure 5015. Fifth Timing Period, Functional Diagram

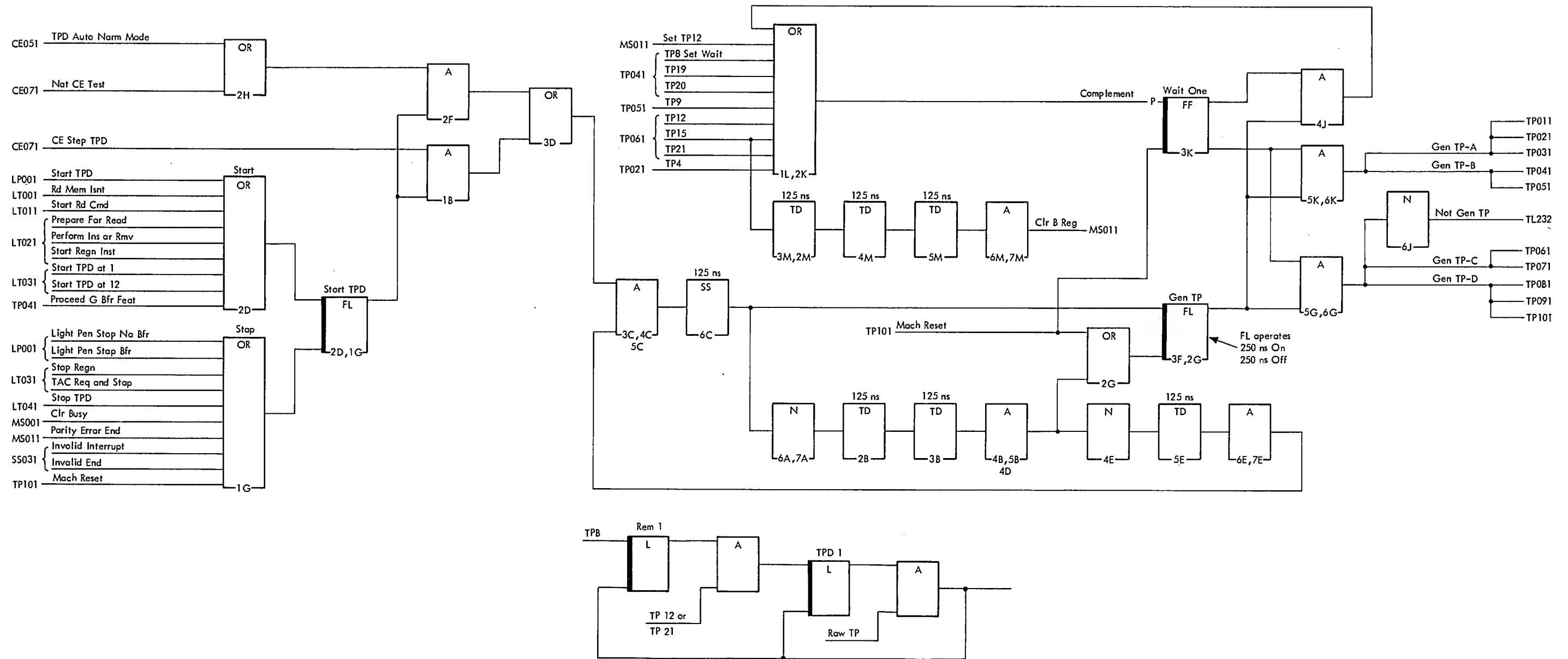


Figure 5016. Timing Pulse Generator, Functional Diagram

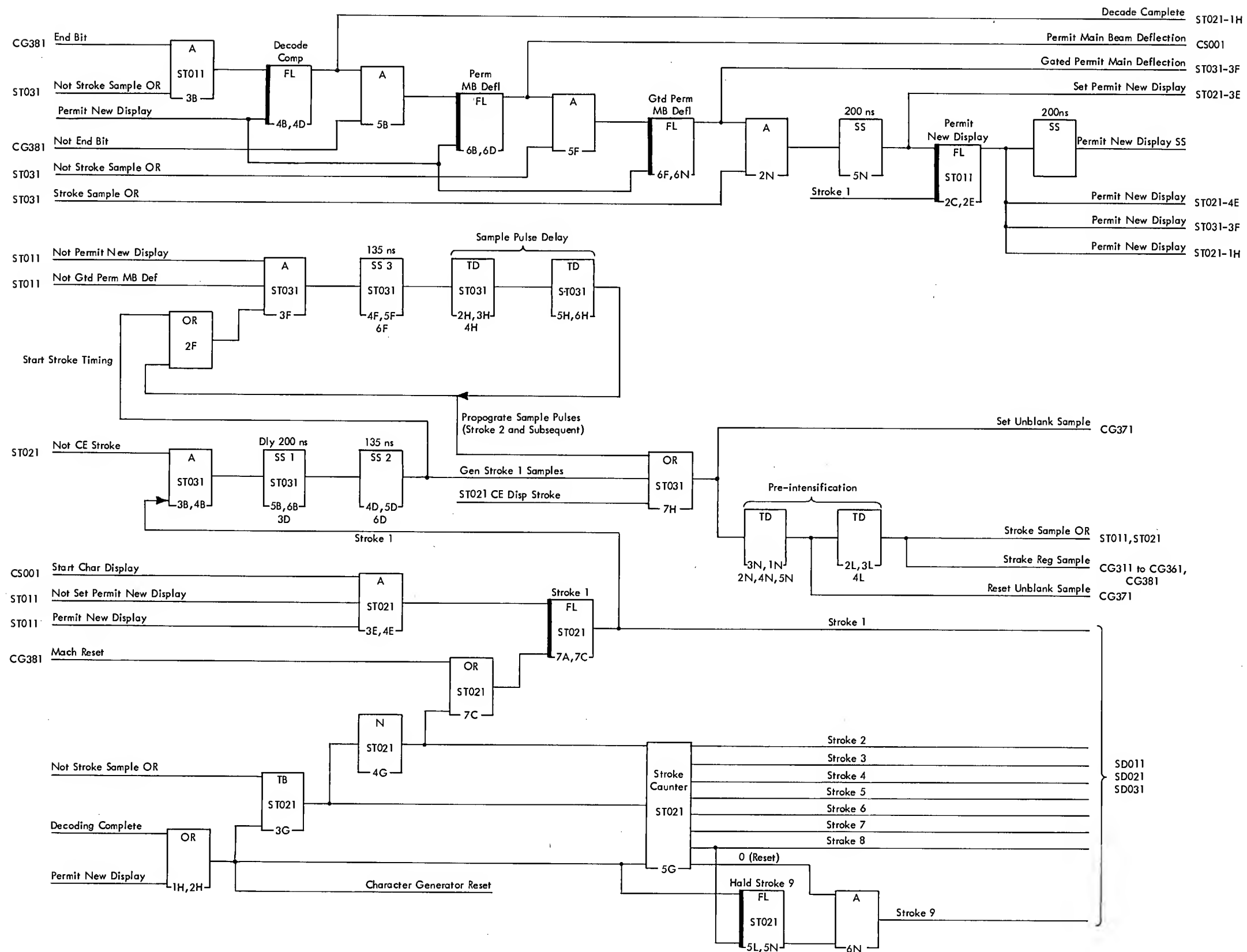


Figure 5017. Stroke Timing and Control

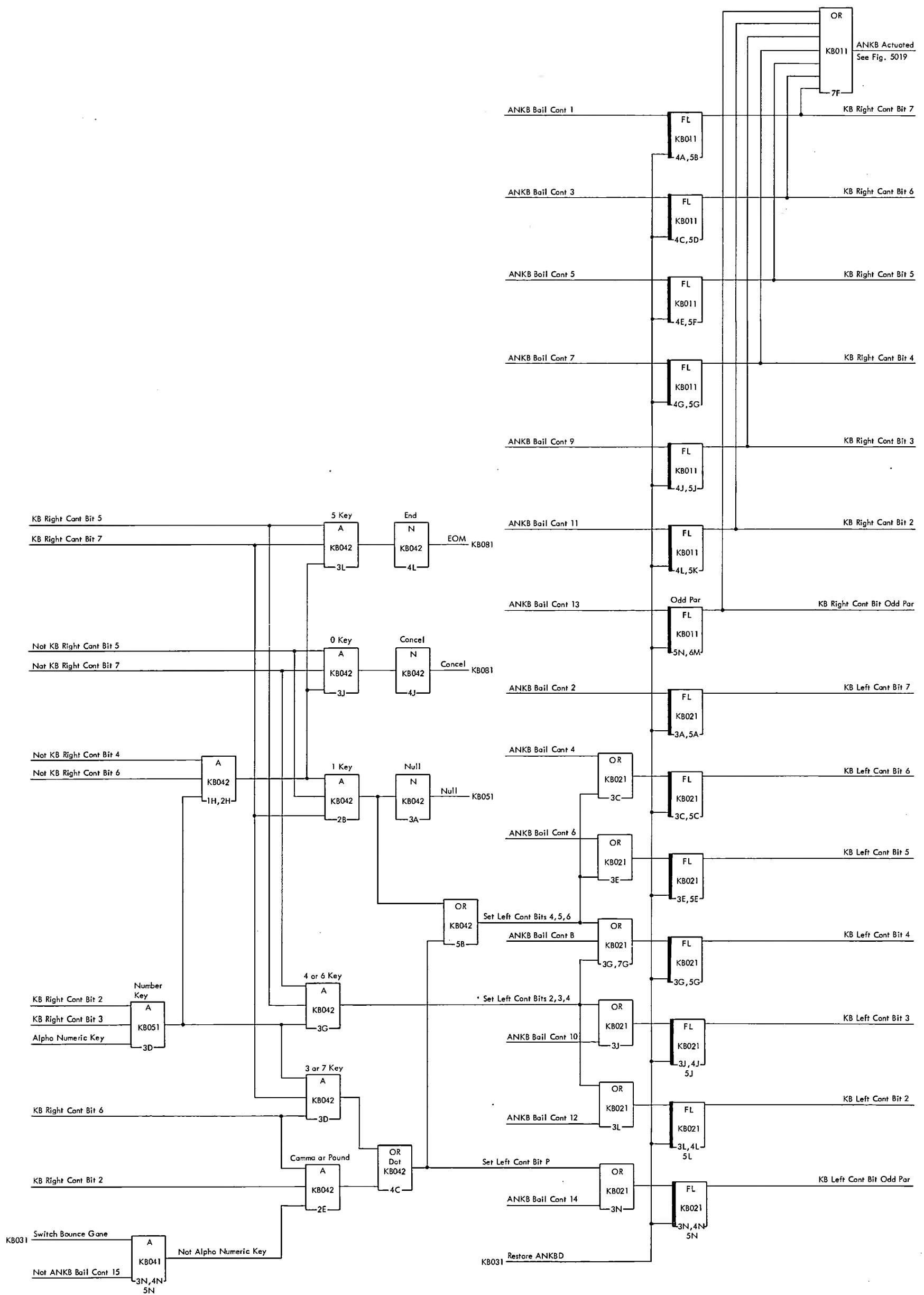


Figure 5018. A/N Keyboard Data Encoding Diagram

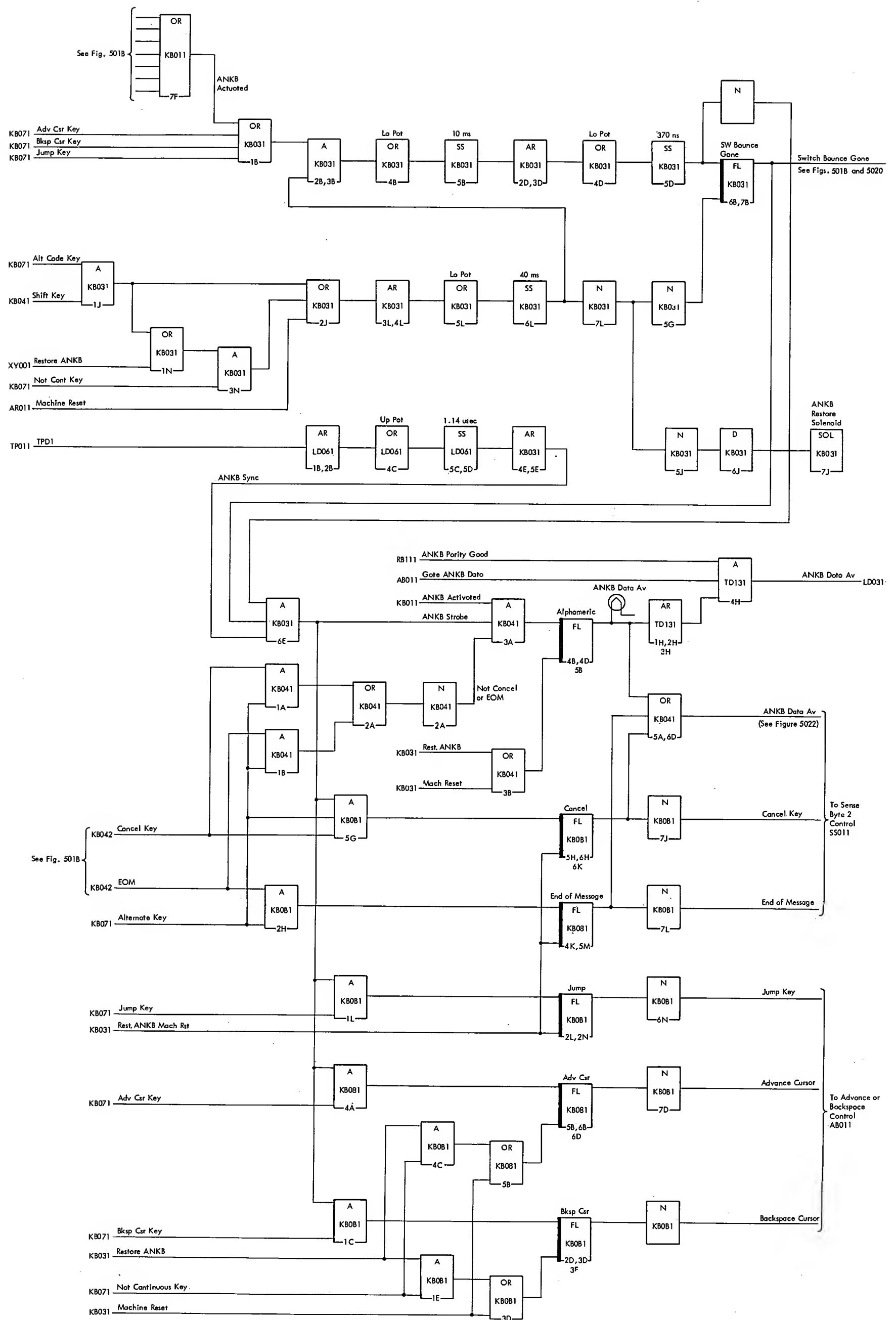


Figure 5019. A/N Keyboard Sense and Cursor Data Generation

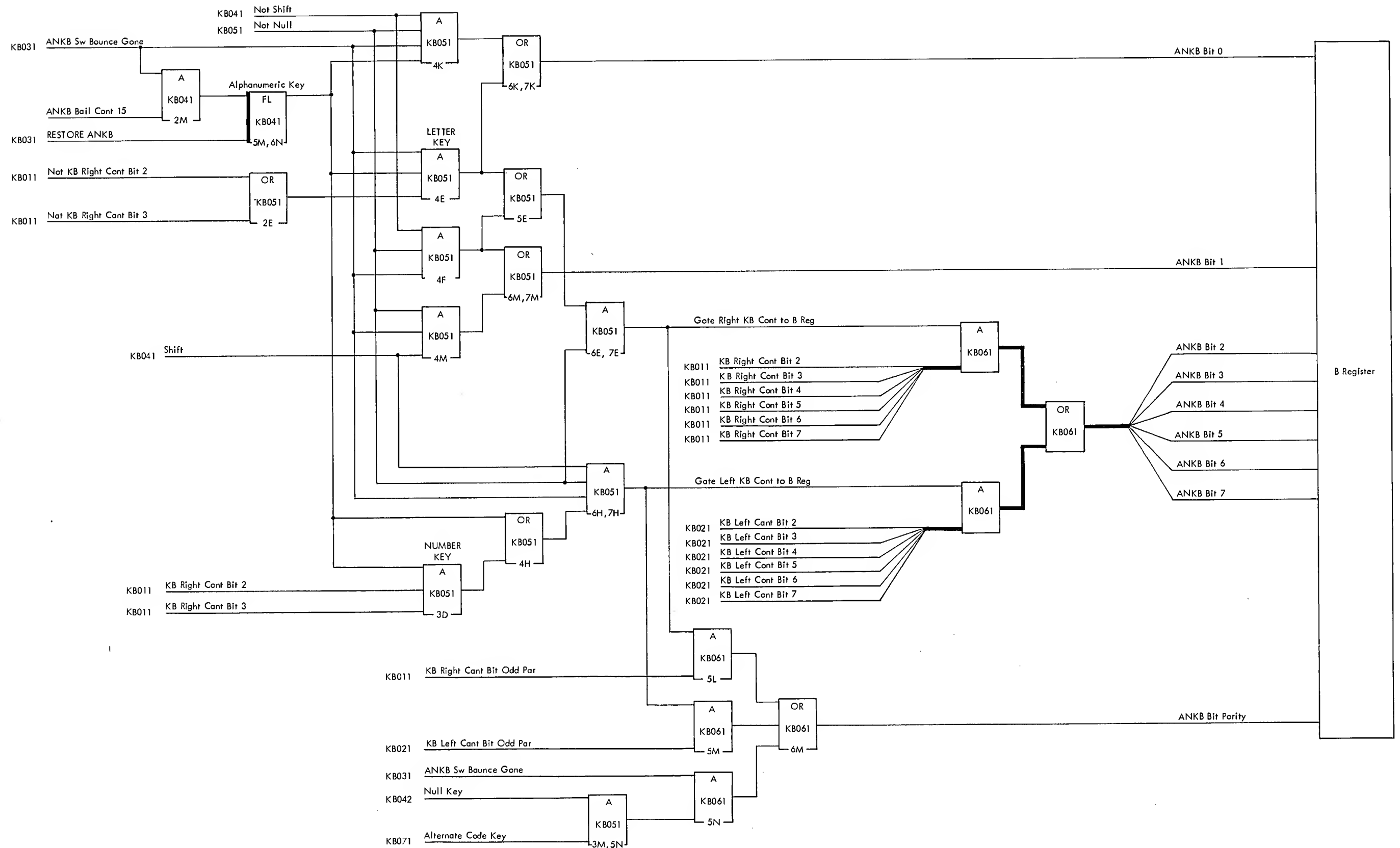


Figure 5020. A/N Keyboard Code Generation and Transfer

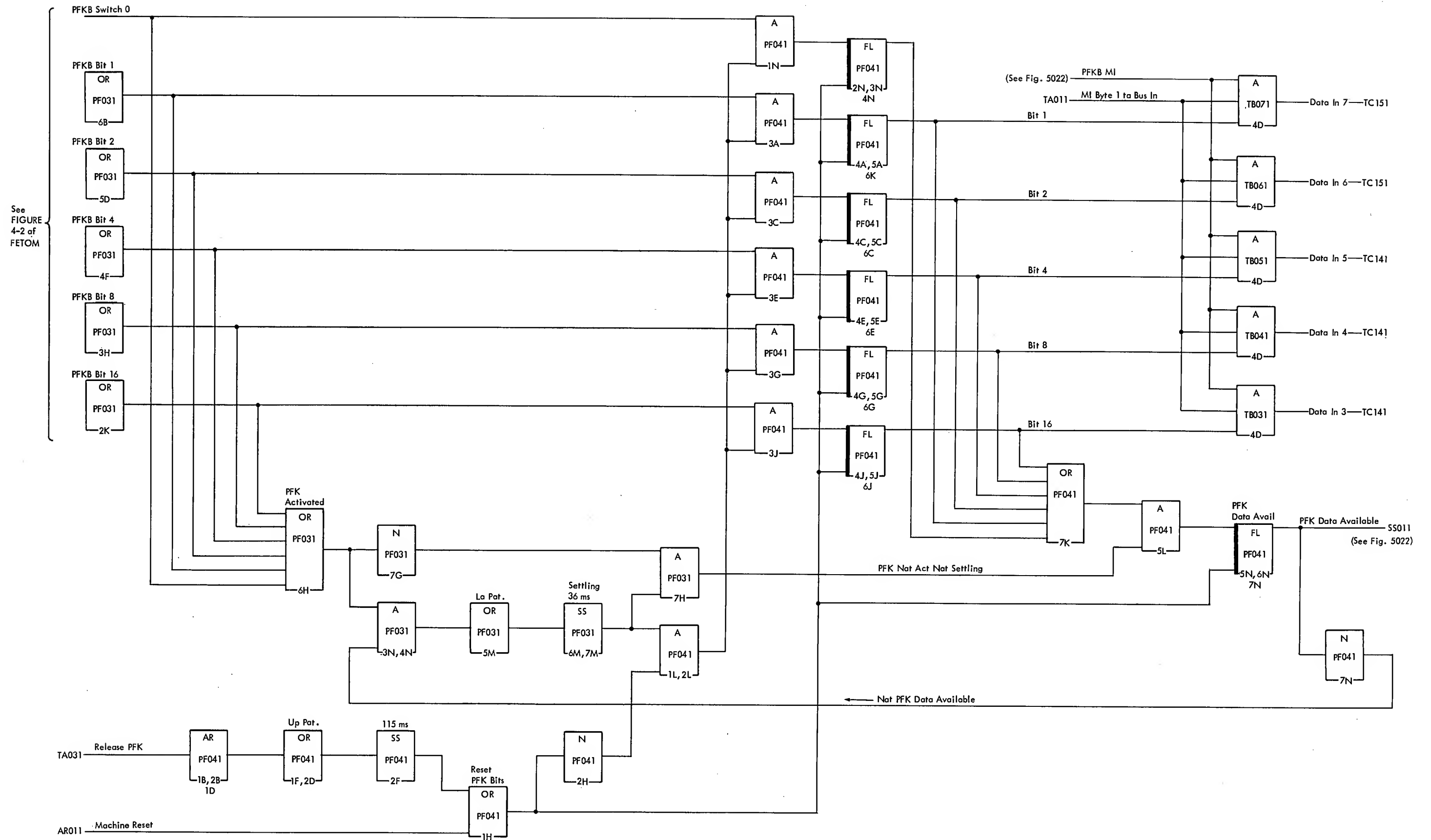


Figure 5021. Program Function Keyboard Data Encode and Entry

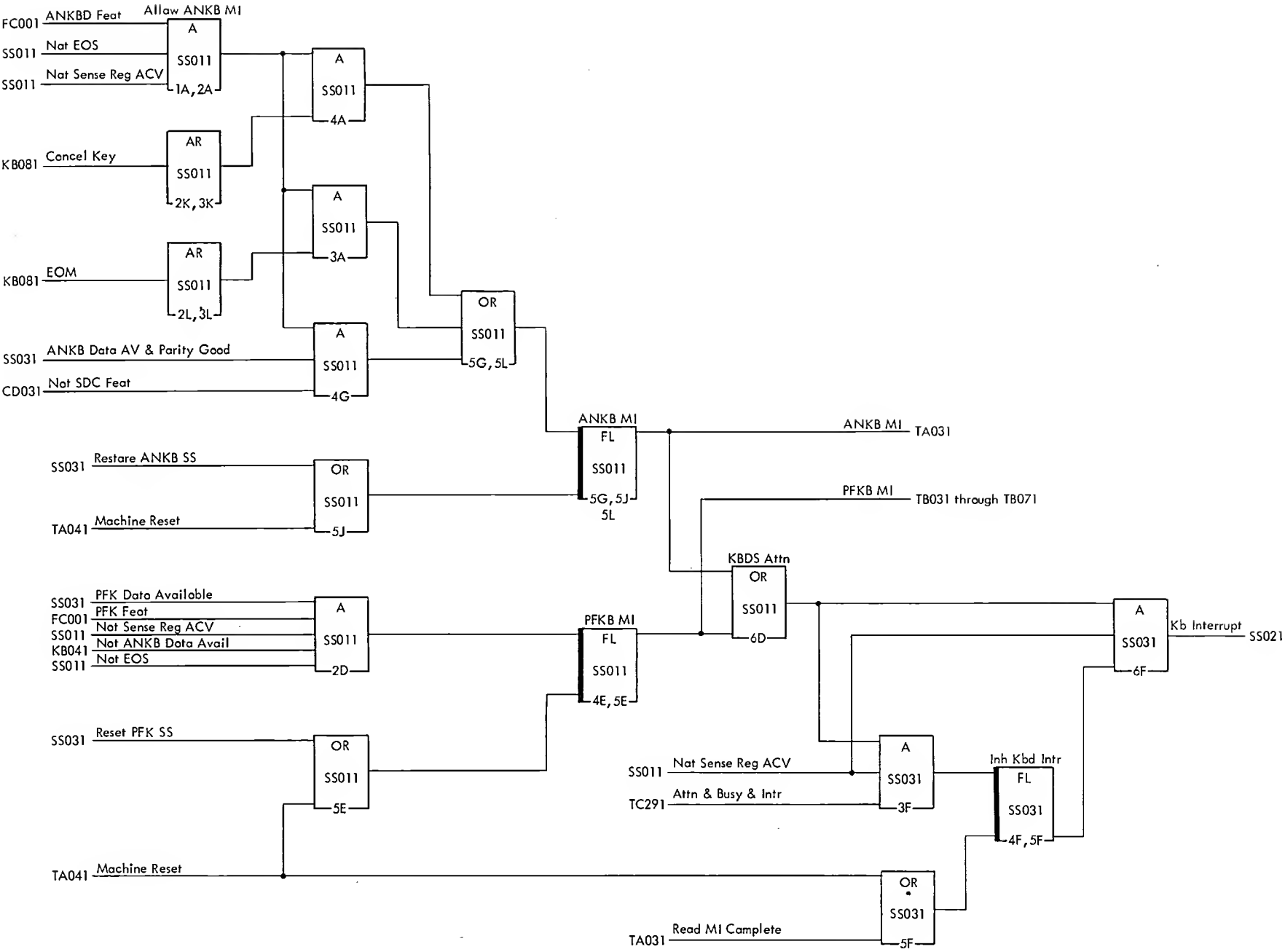


Figure 5022. A/N and PF Keyboards Interrupt

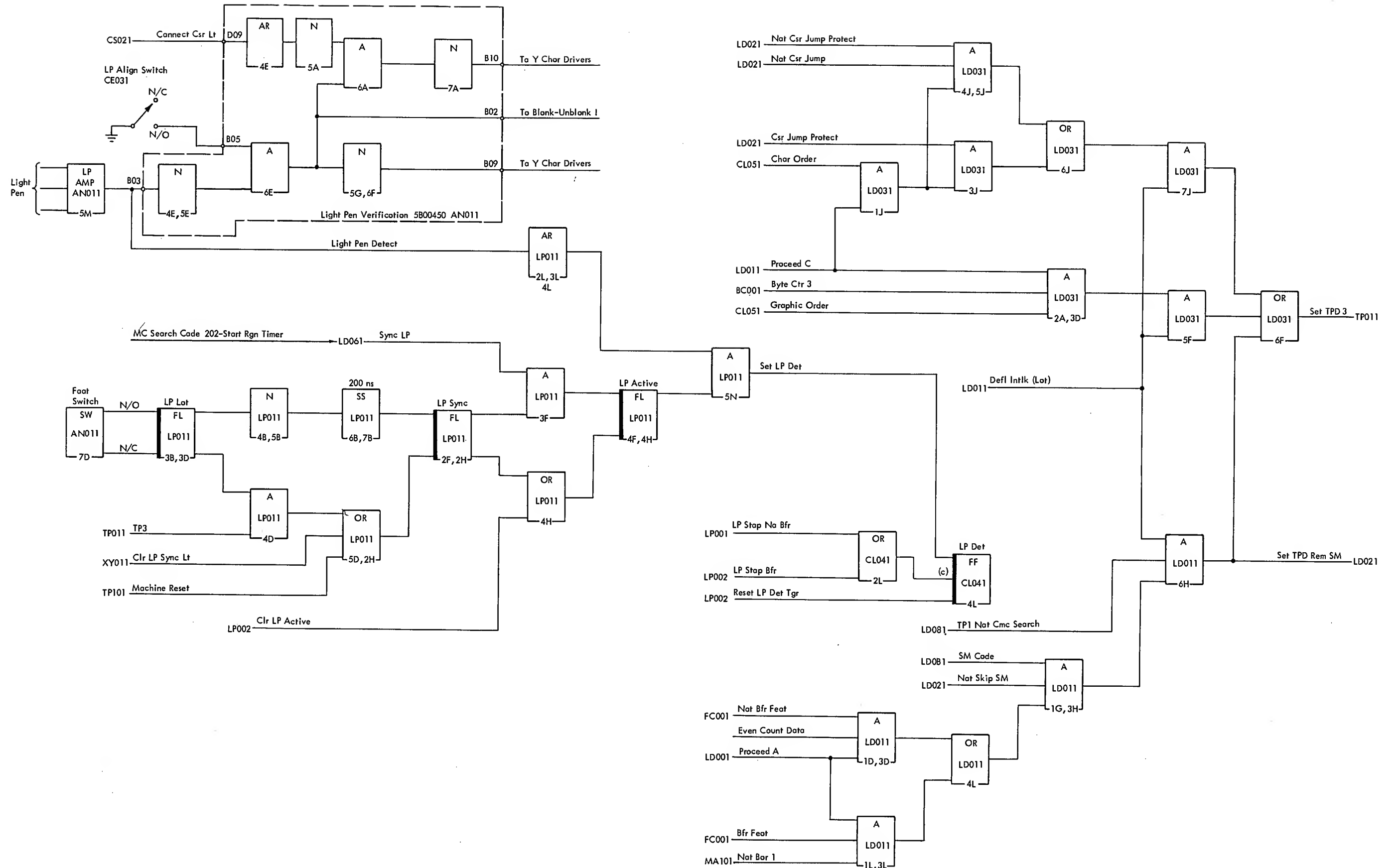


Figure 5023. Light Pen Deflection

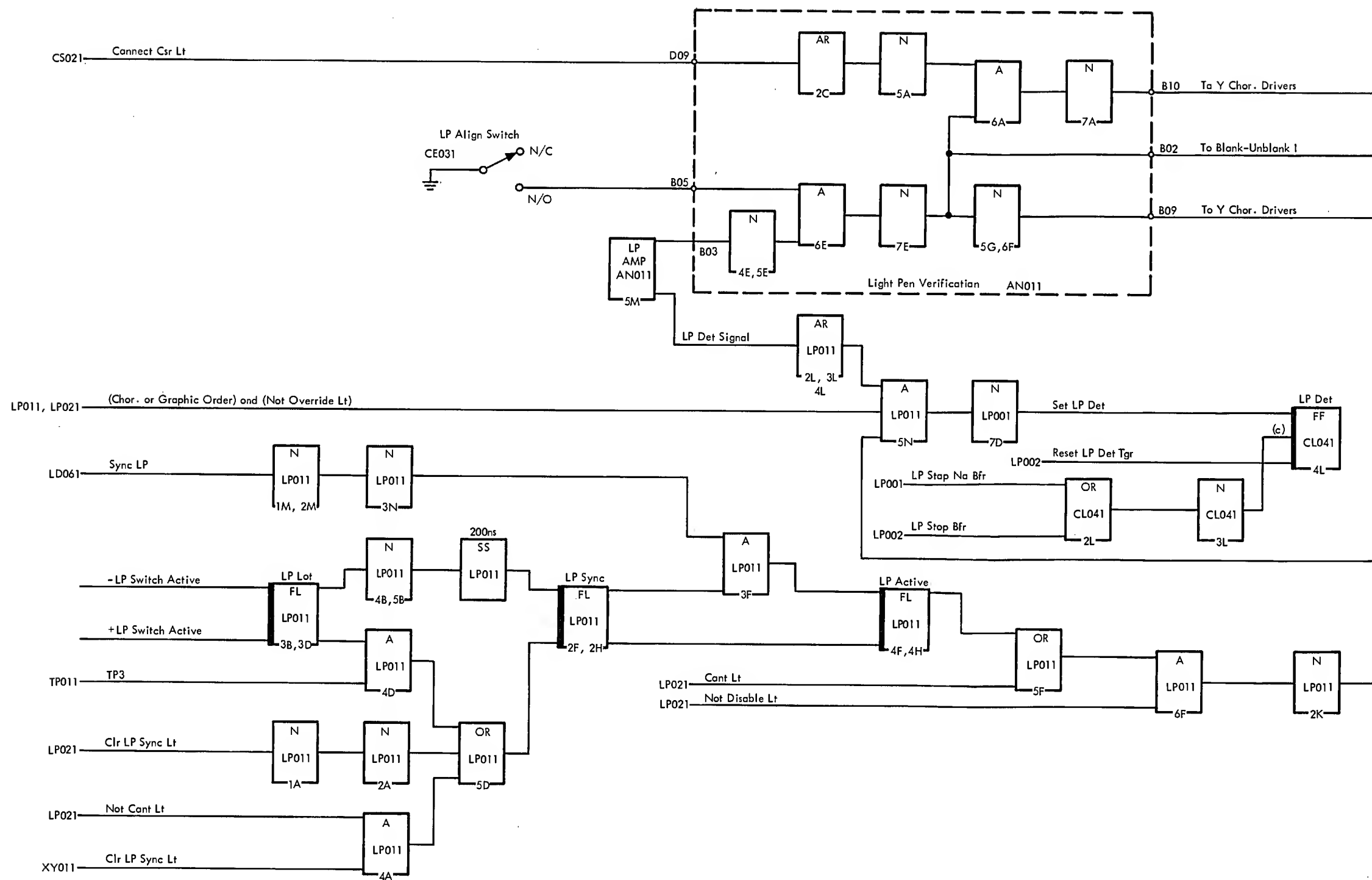


Figure 5023GDF. Light Pen Deflection (for GDF Machines)

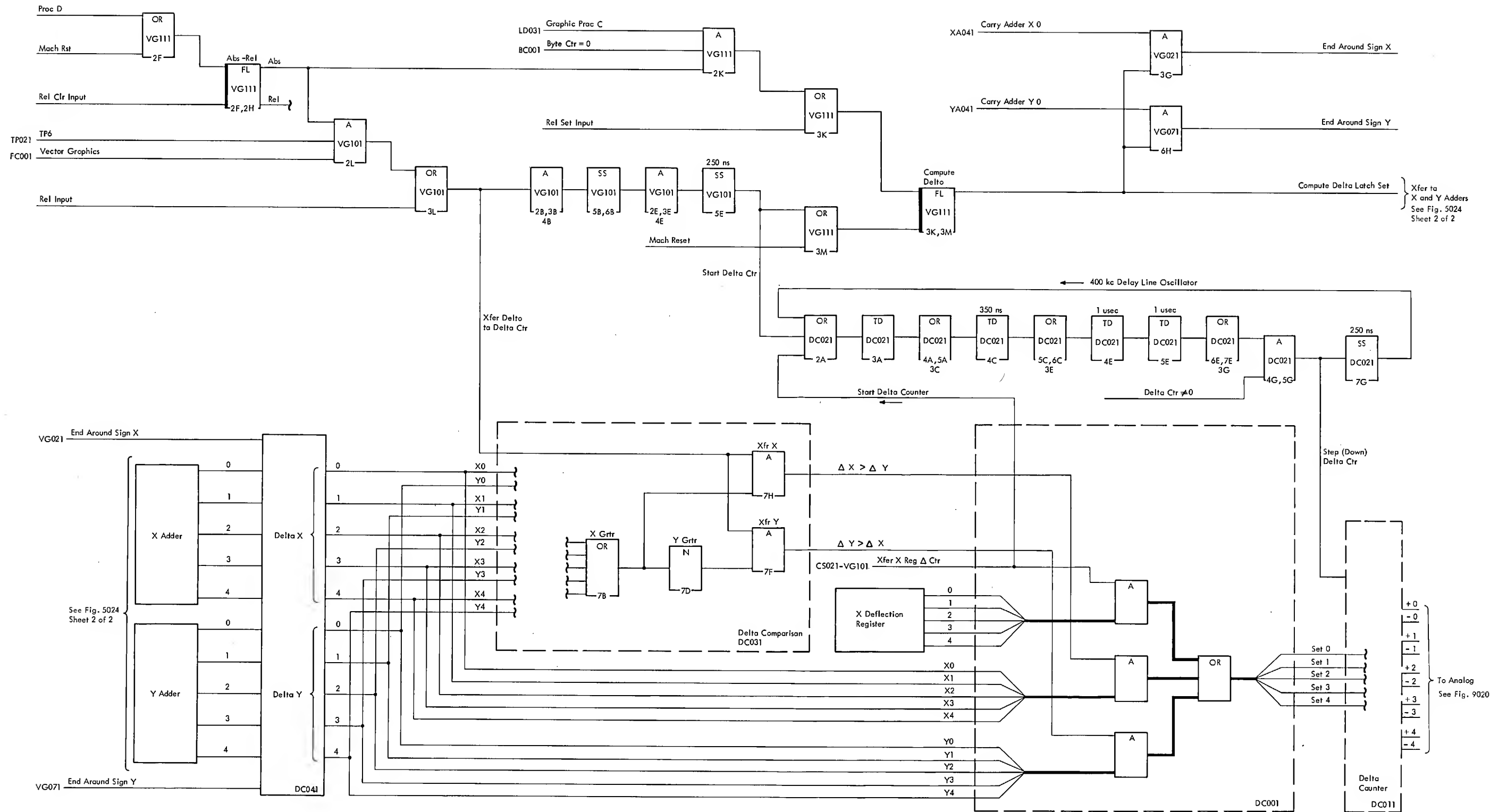


Figure 5024. Absolute Vector Graphics Control (Sheet 1 of 2)

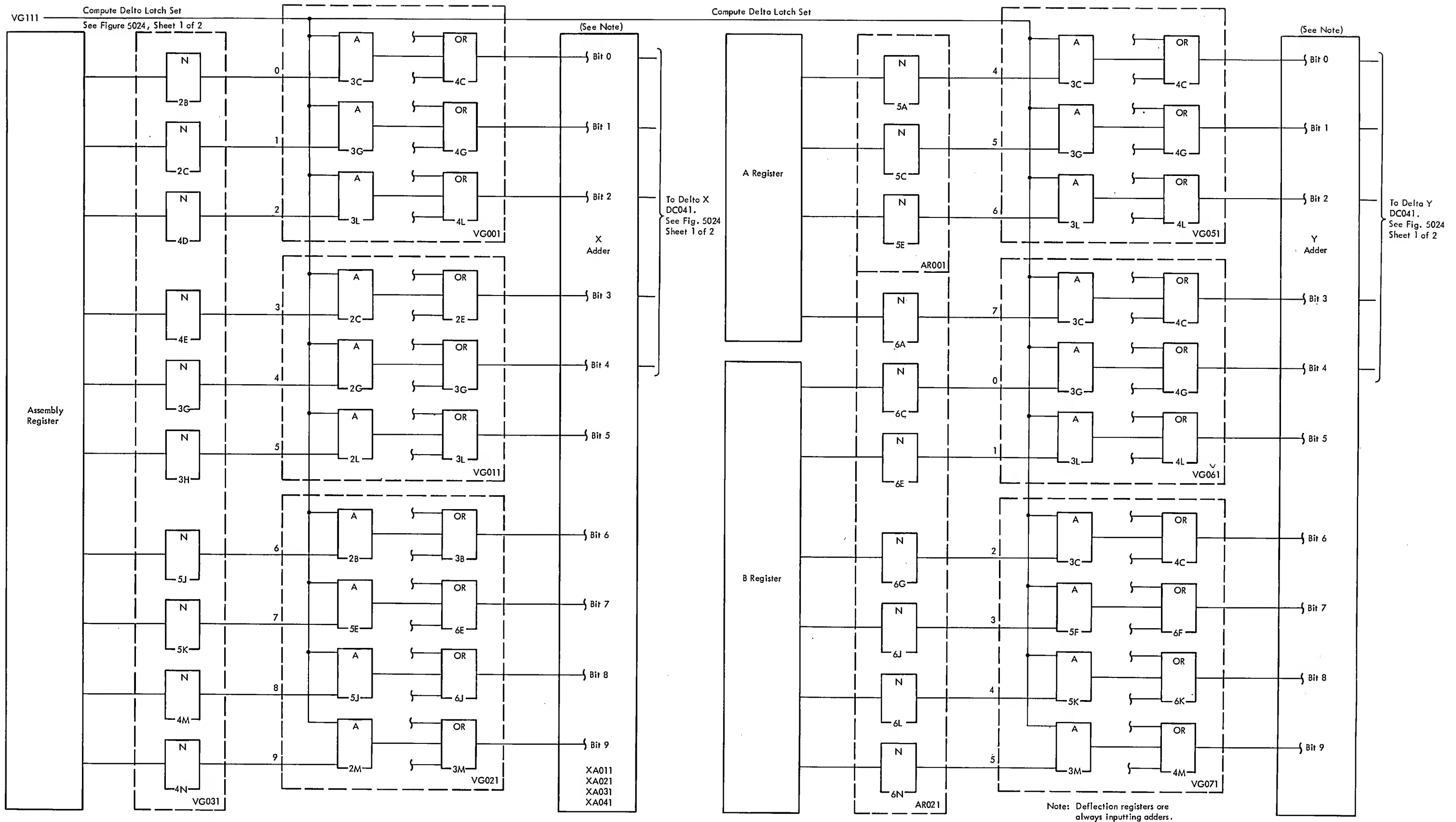


Figure 5024. Absolute Vector Graphics Control (Sheet 2 of 2)

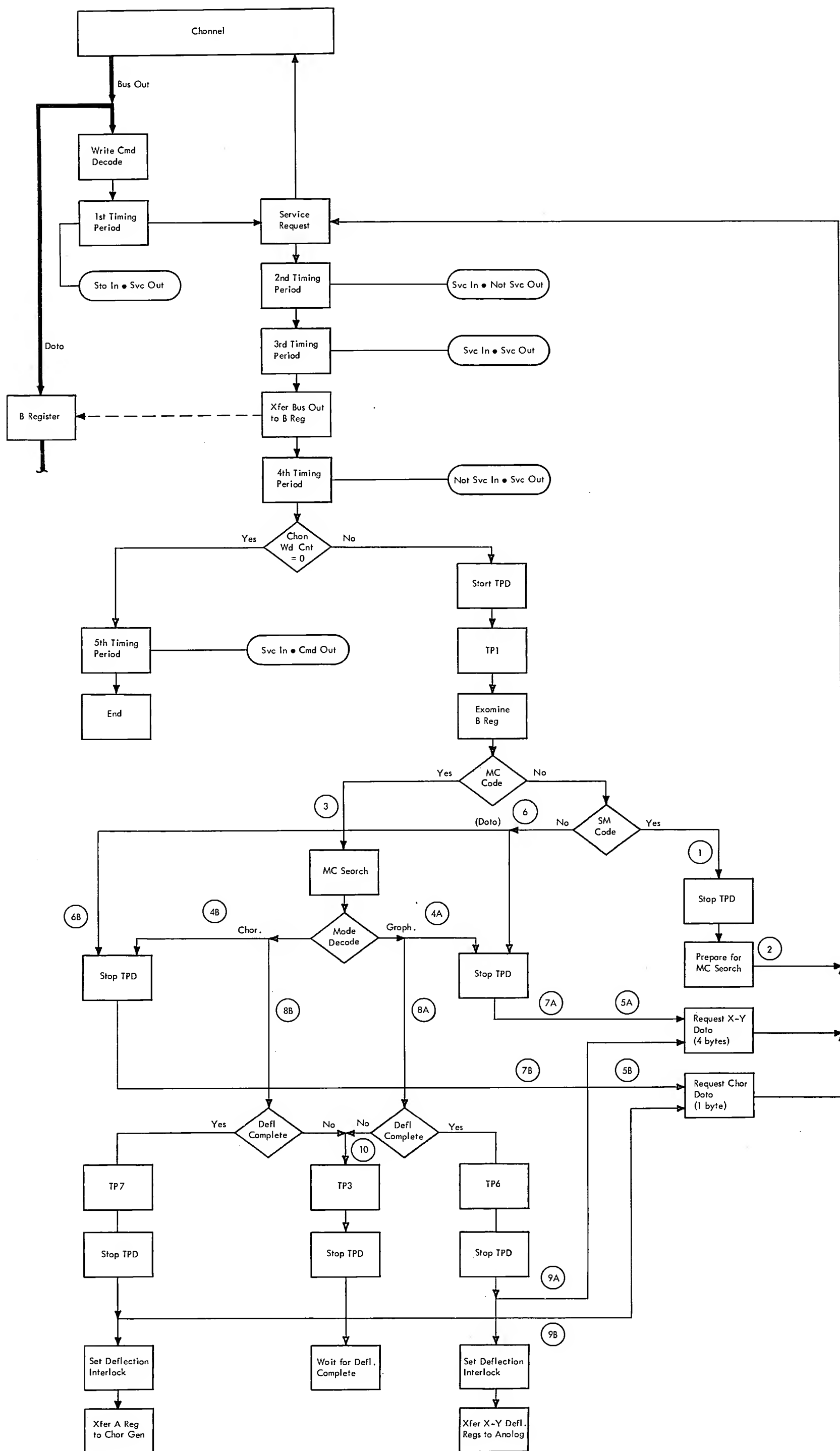


Figure 6000. Write Direct Command Process, Simplified Flow Chart

Figure 6001. Buffer Regeneration Timing Sequence, Simplified Flow Chart

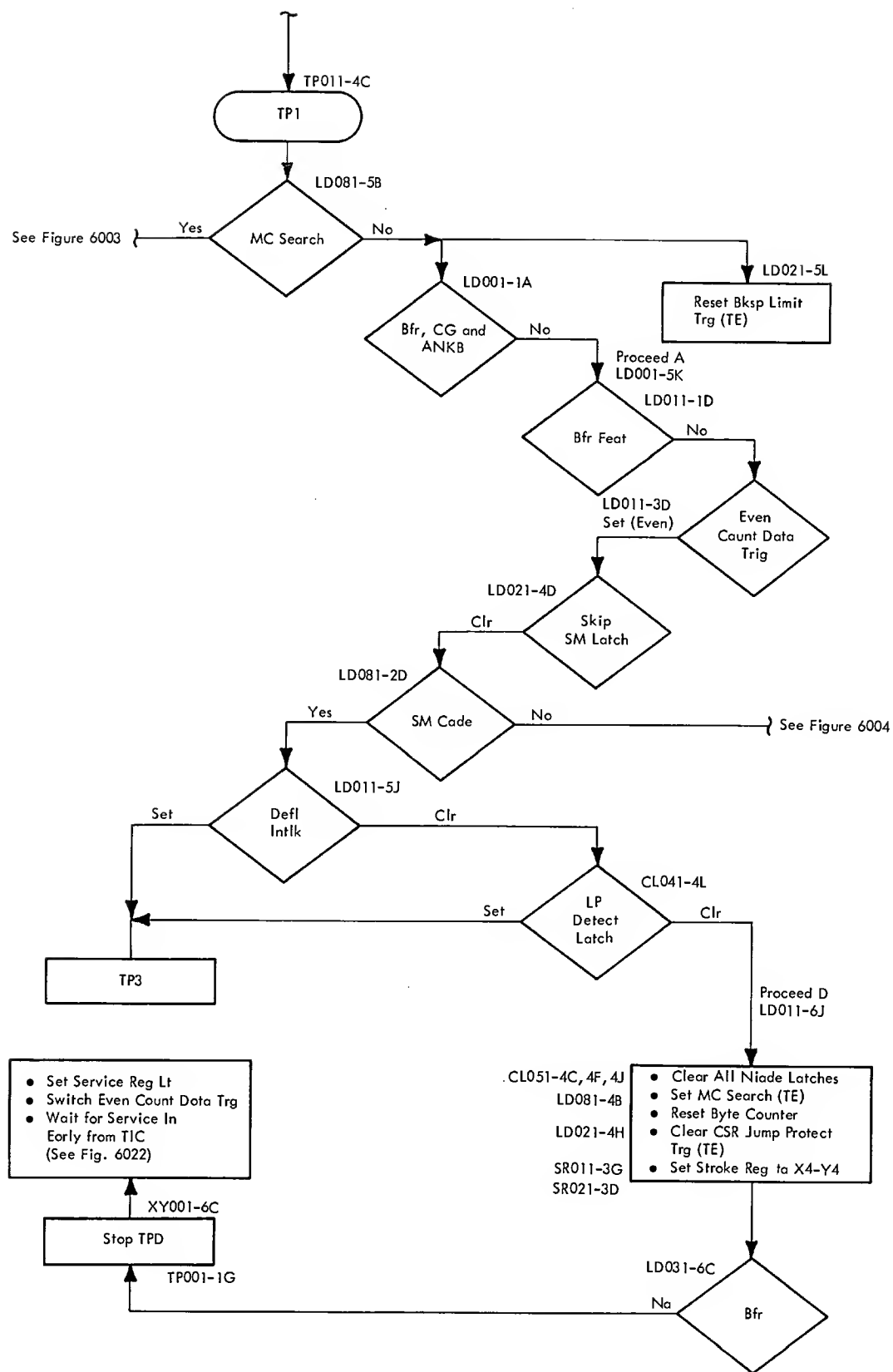


Figure 6002. SM Search-Write, No Buffer, Flow Chart

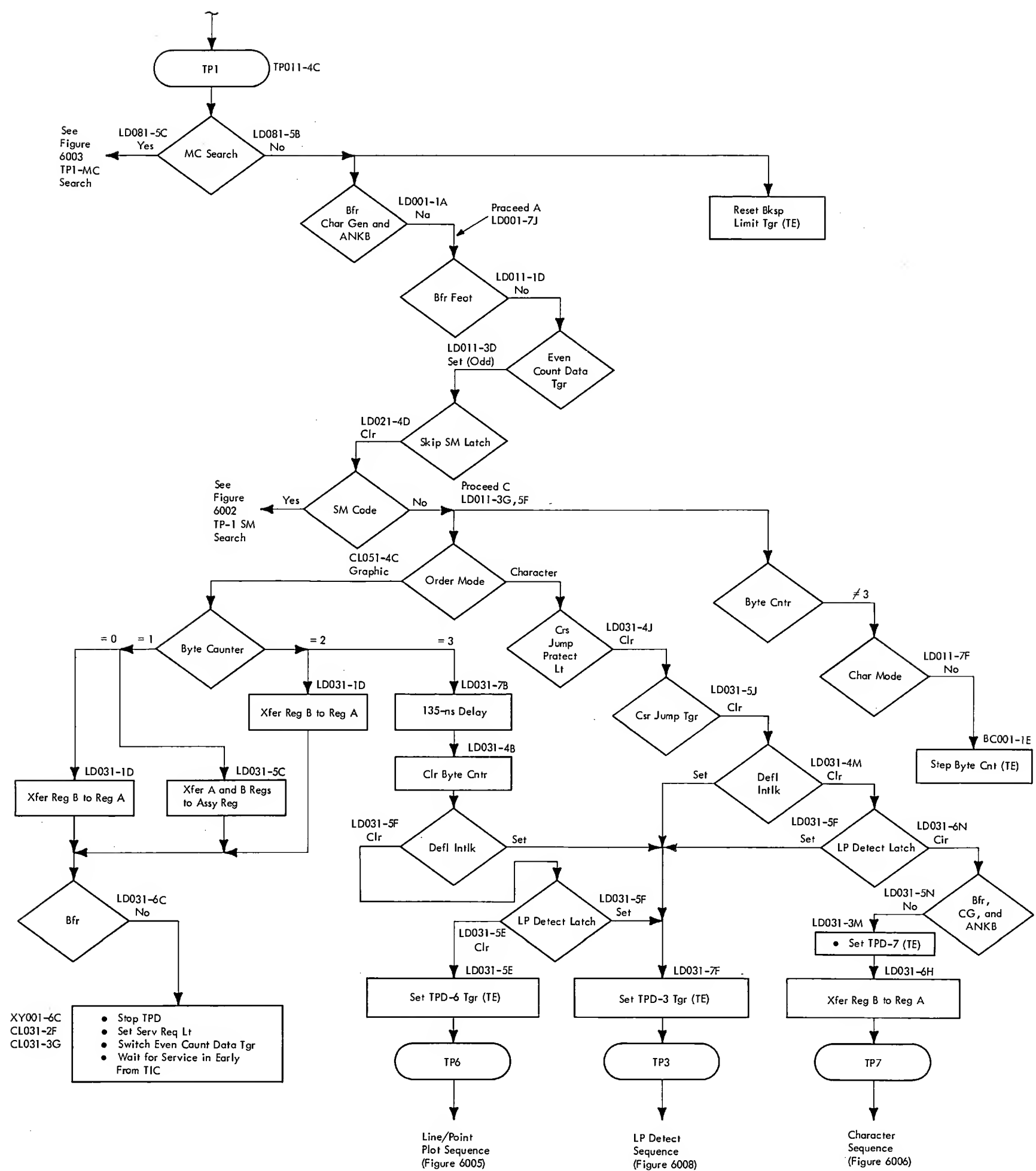


Figure 6004. Mode Sequence - Graphic or Character No Buffer, Flow Chart

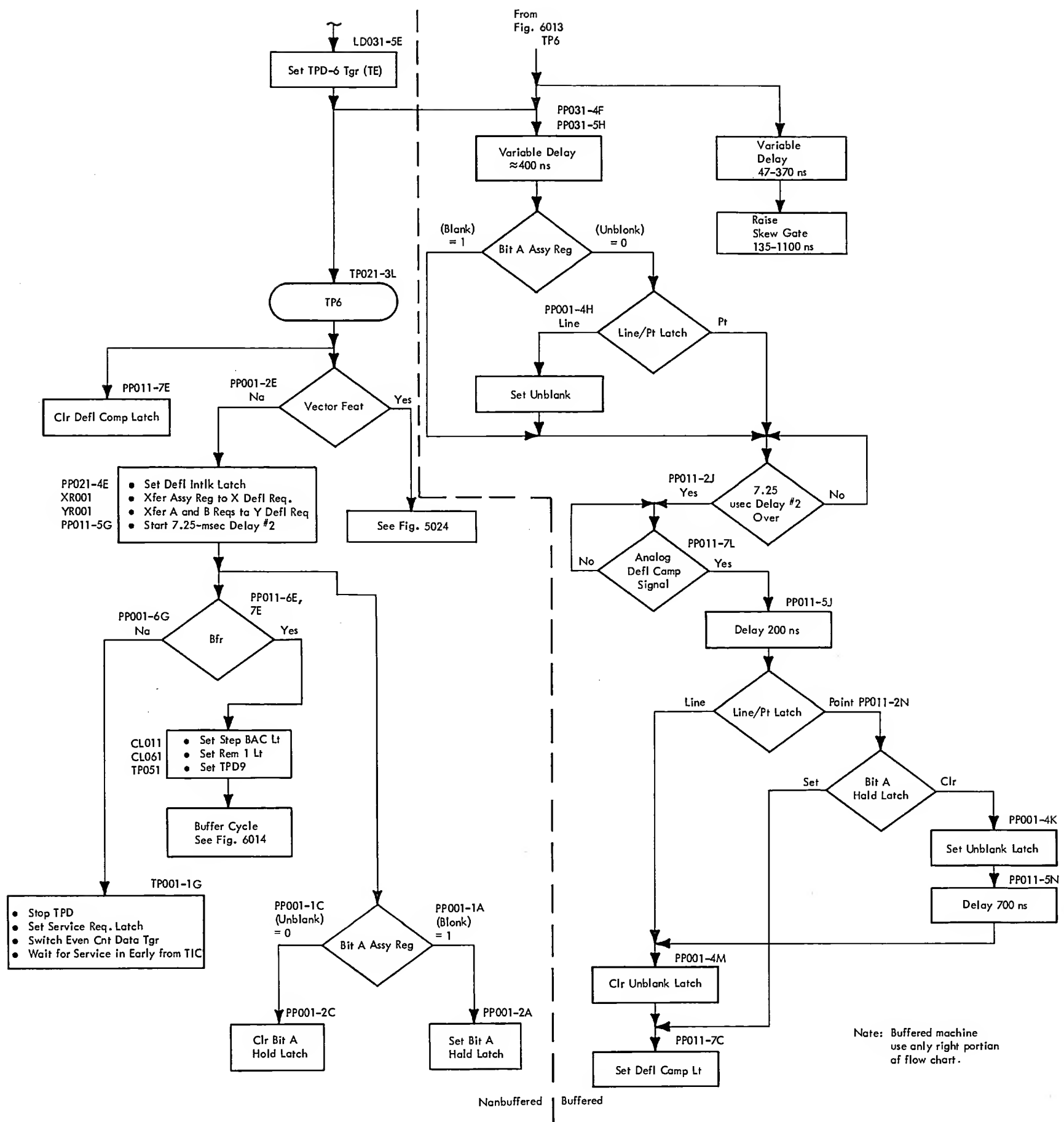


Figure 6005. Line/Point Sequence, Flow Chart

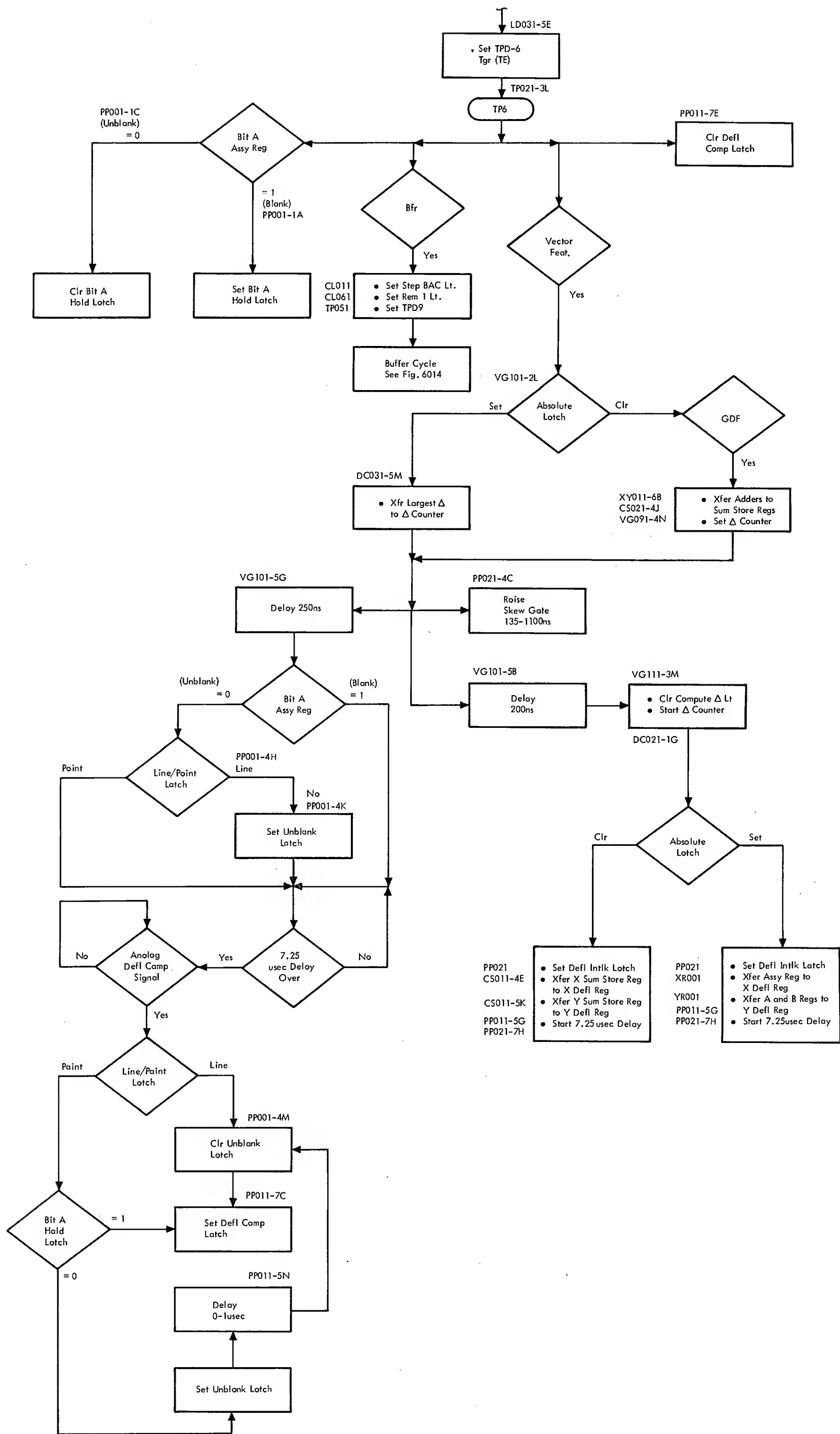


Figure 6005GDF. Line/Point Sequence, Flow Chart (for GDF Machines)

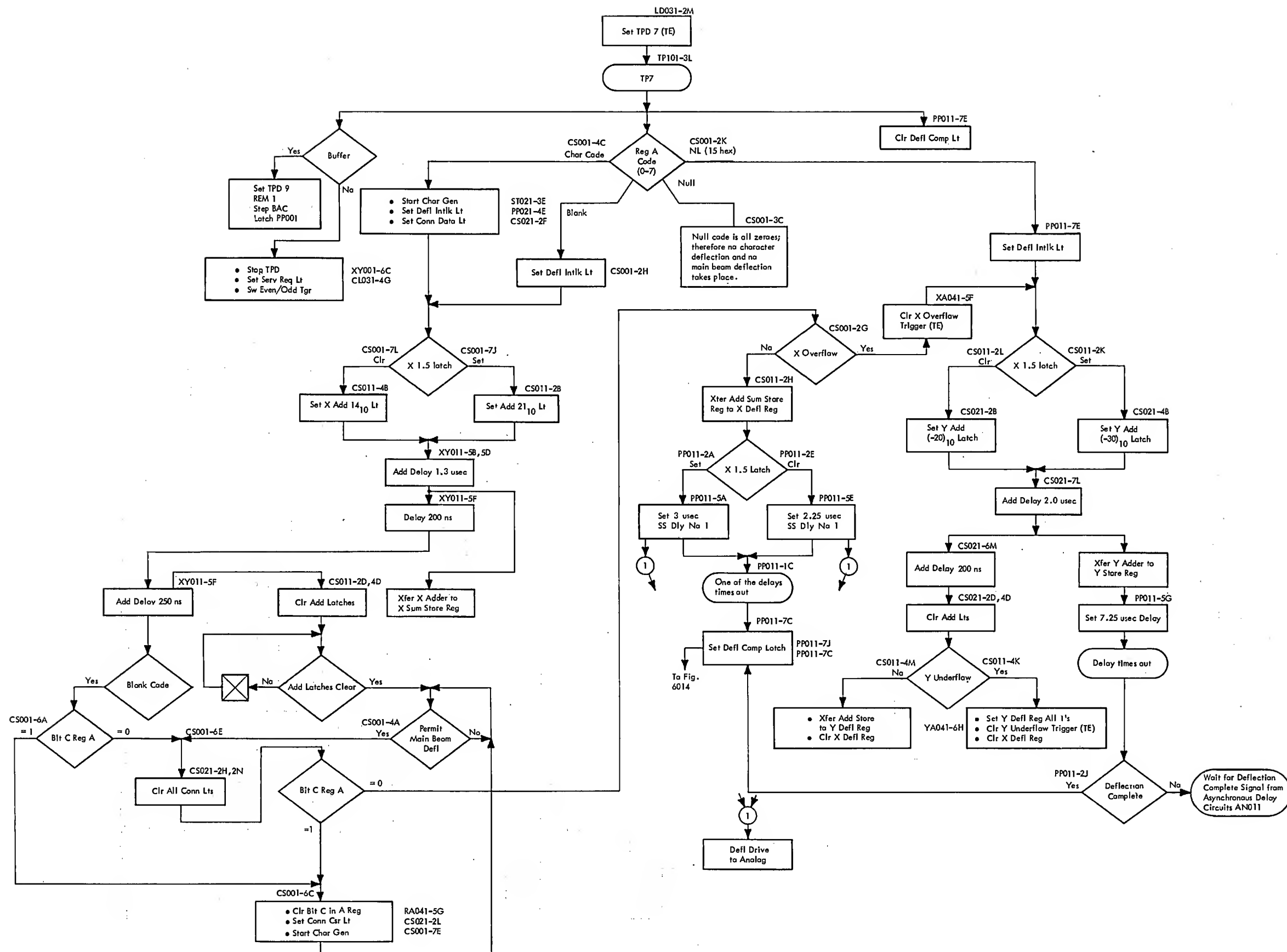
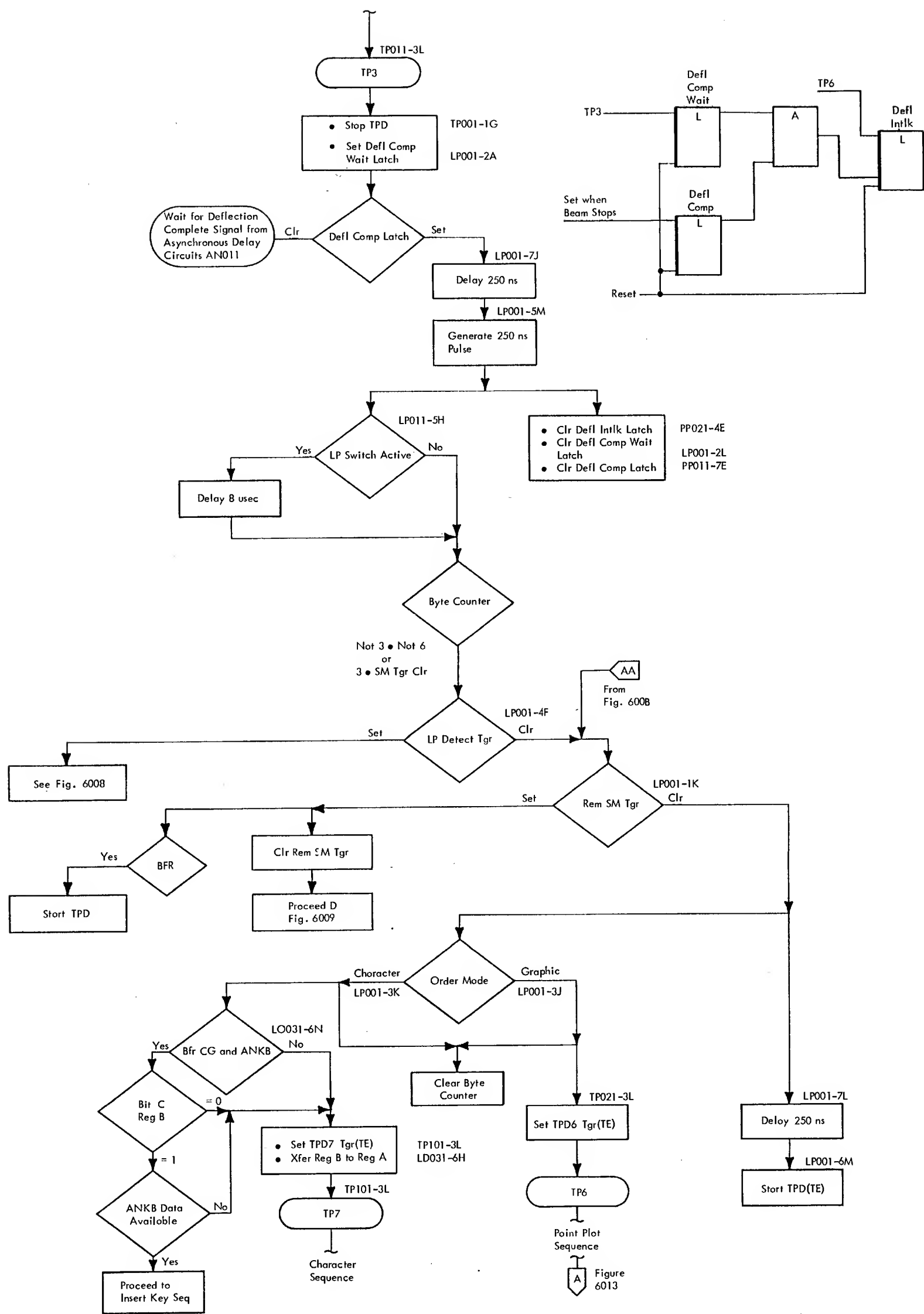


Figure 6006. Character Sequence, Flow Chart



●Figure 6007. Deflection Interlock Wait (No LP Detect) Flow Chart

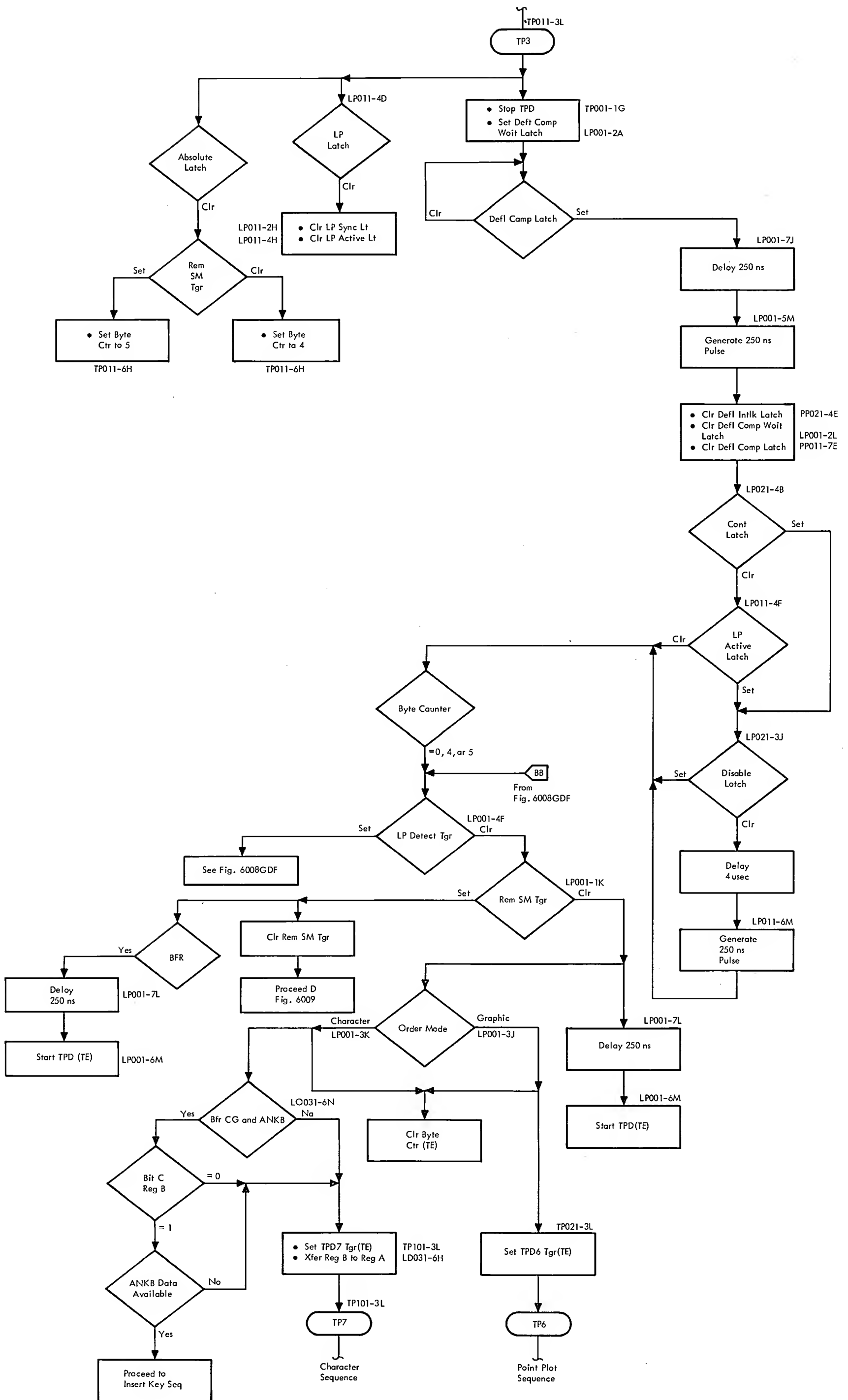
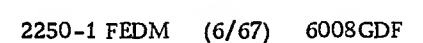
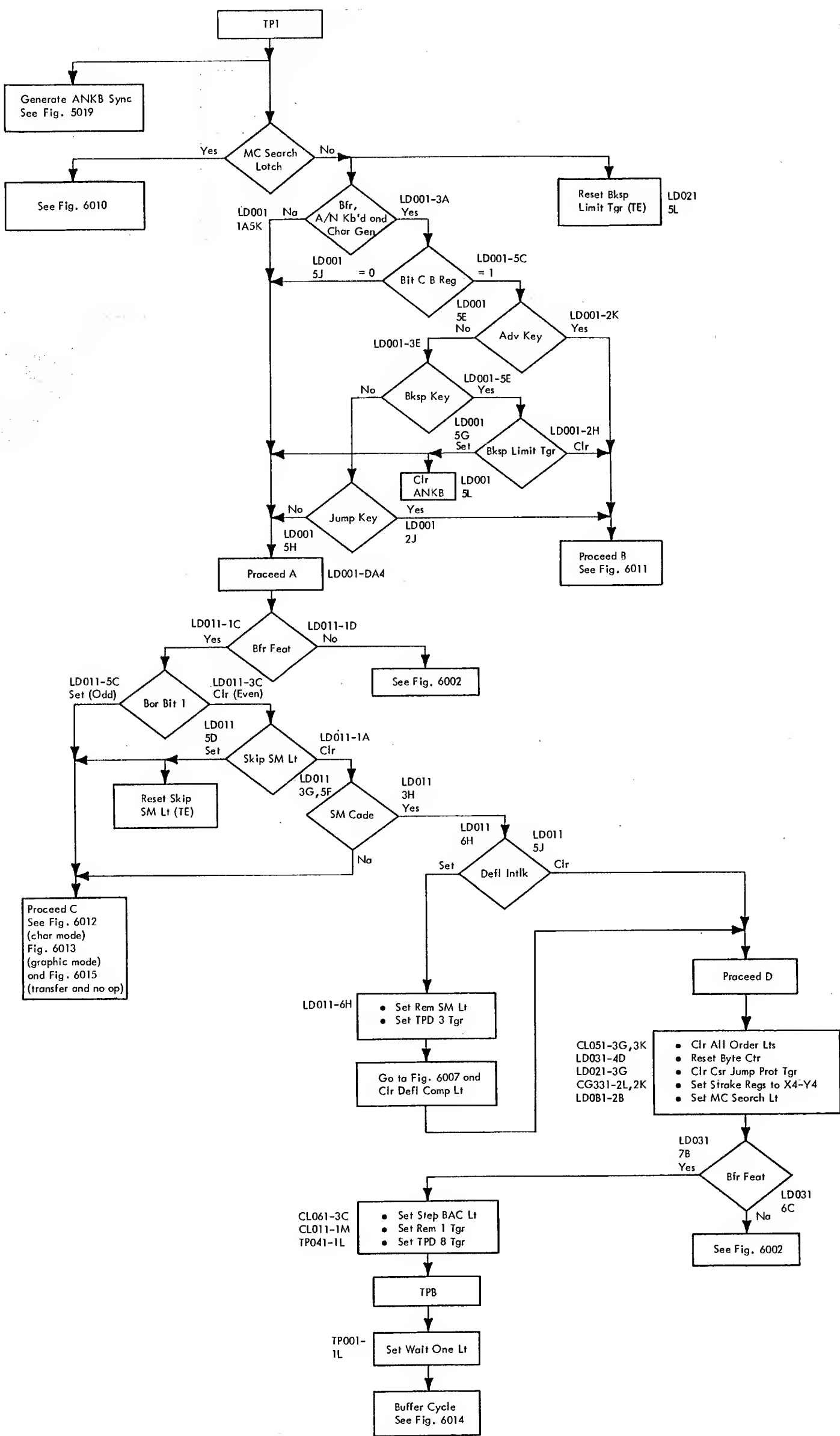


Figure 6007GDF. Deflection Interlock Wait (No LP Detect) Flow Chart (for GDF Machines)





●Figure 6009. Buffer Regeneration, Proceed A and Proceed D, SM Search, Flow Chart

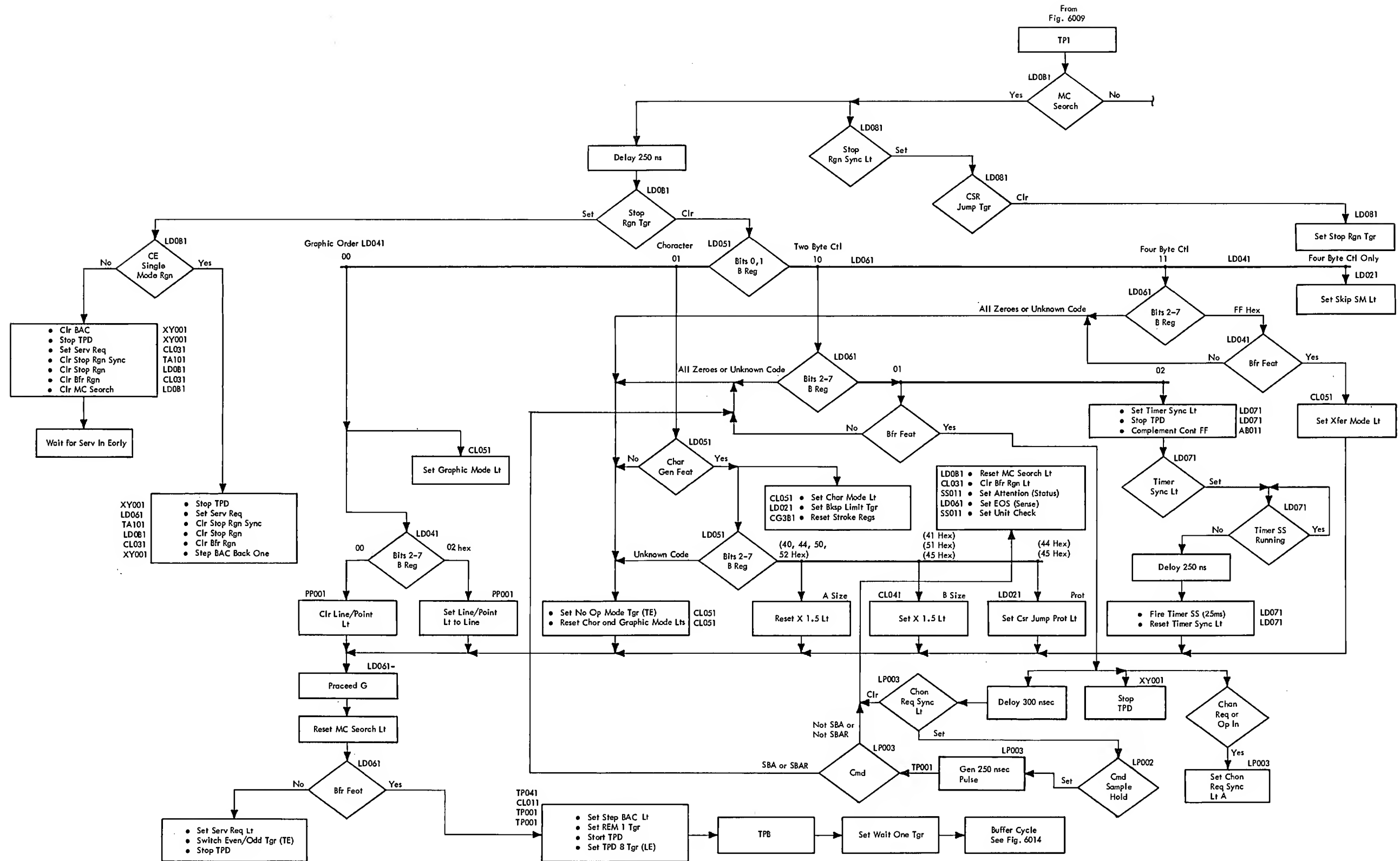


Figure 6010. Buffer Regeneration, MC Search and Proceed G, Flow Chart

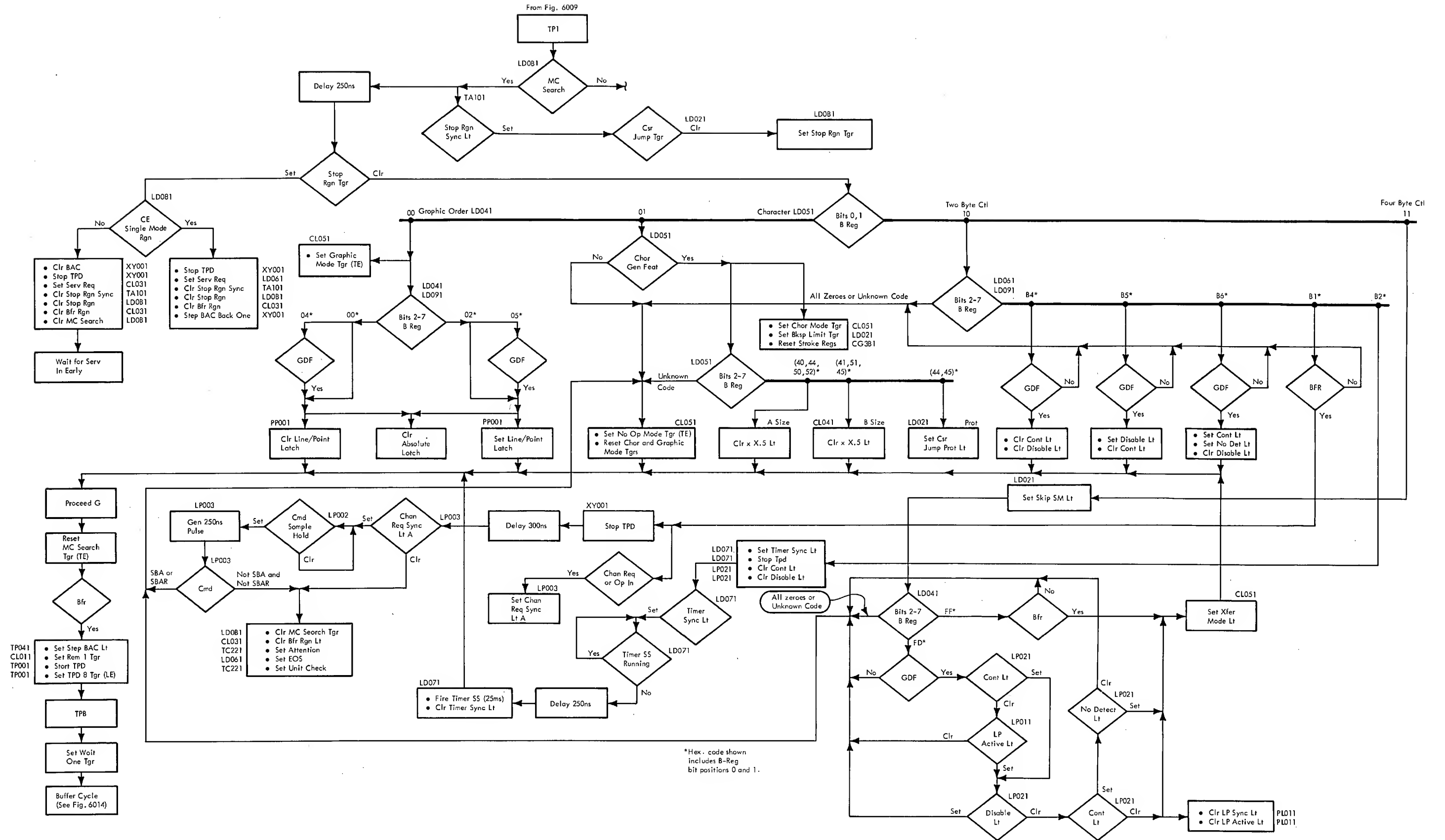


Figure 6010GDF. Buffer Regeneration, MC Search and Proceed G, Flow Chart (for GDF Machines)

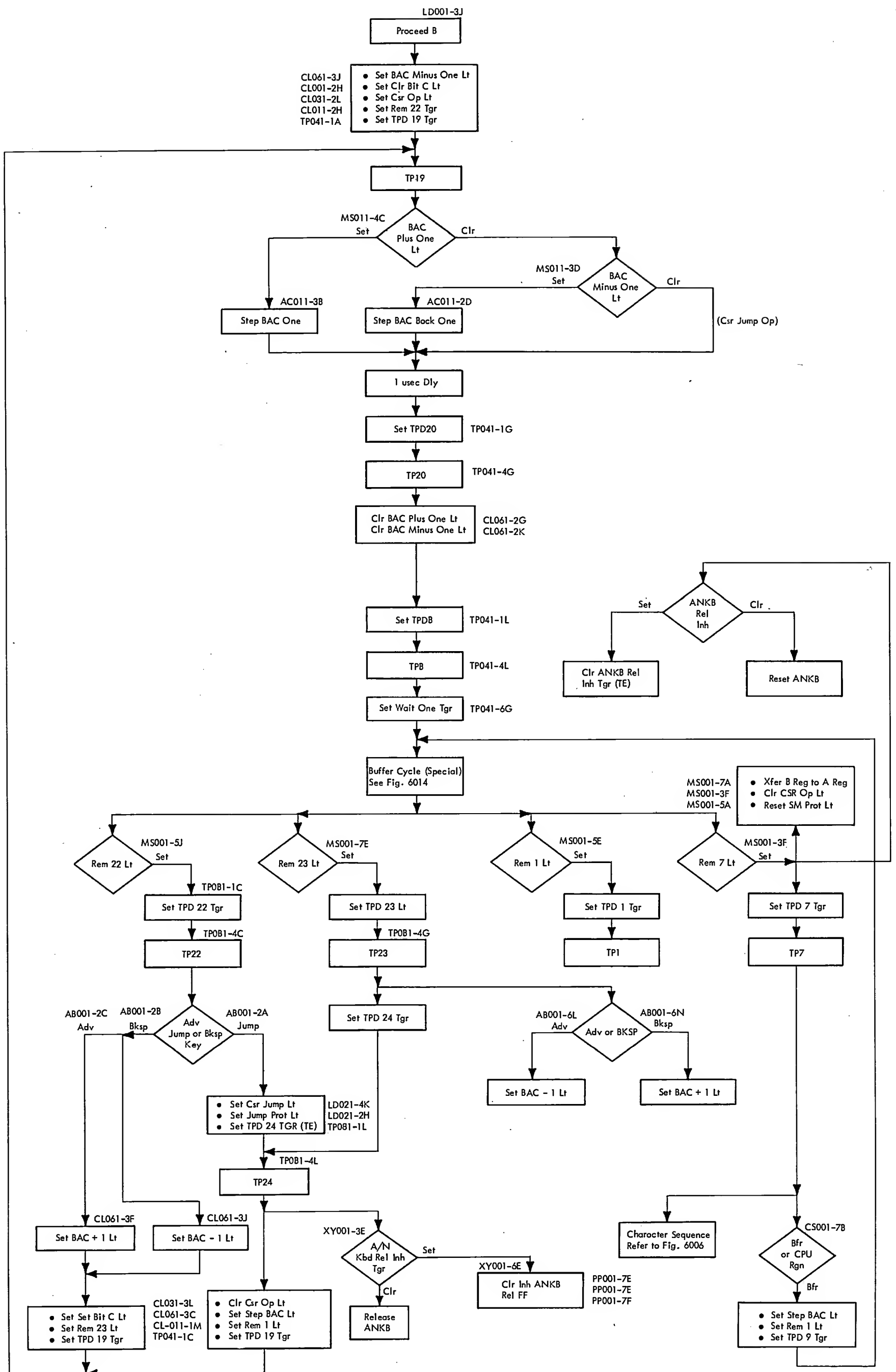
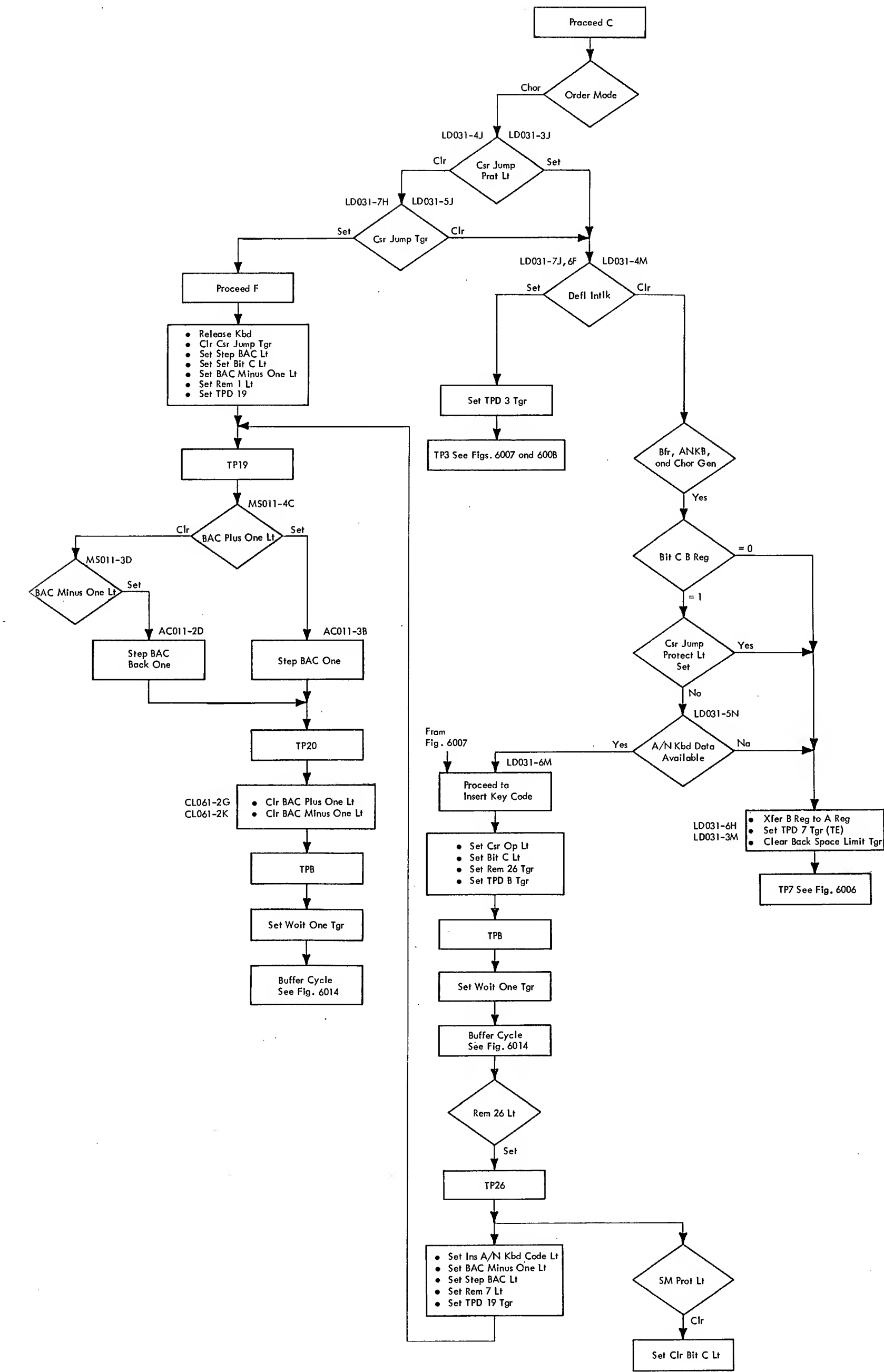
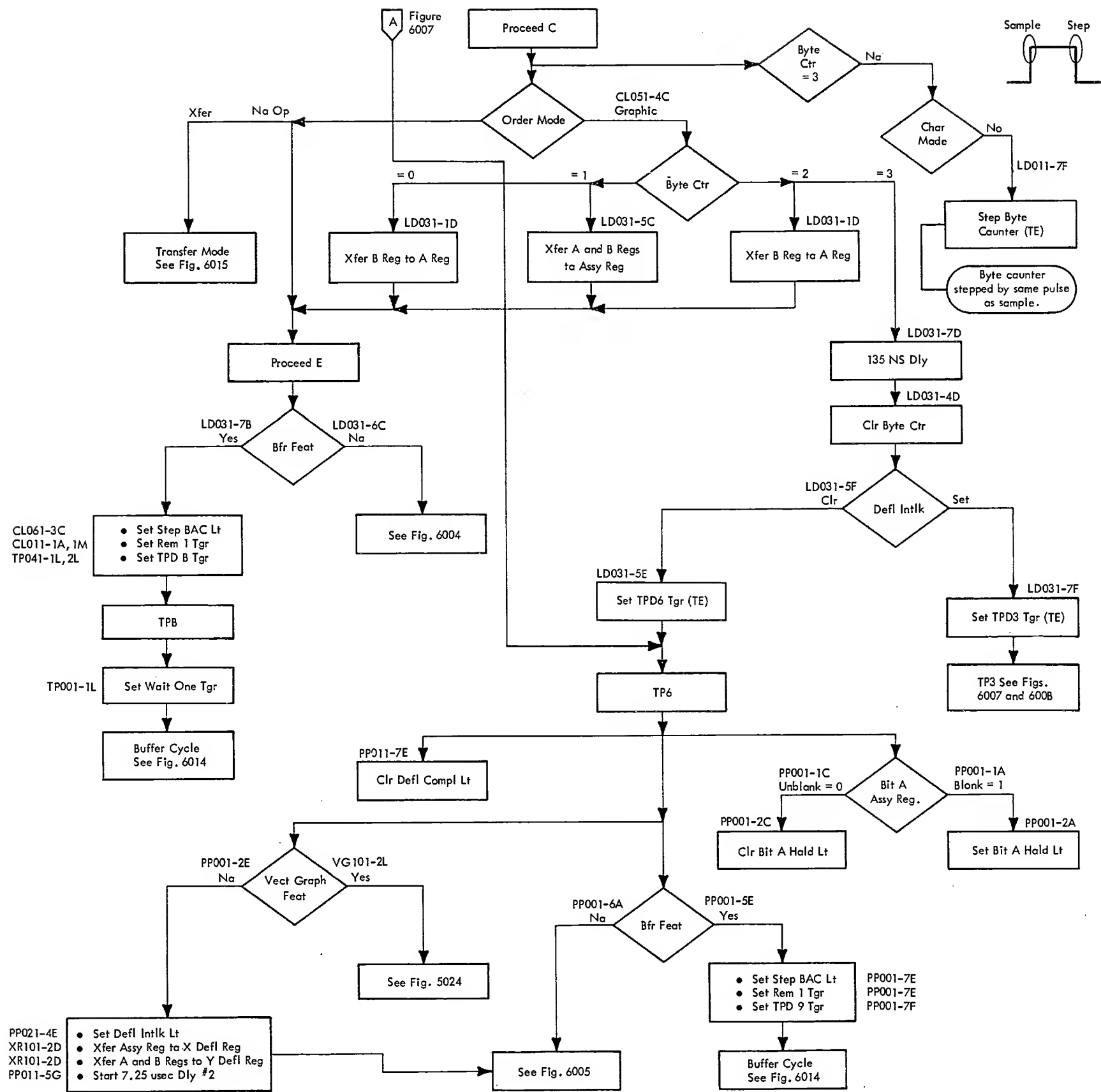


Figure 6011. Buffer Regeneration, Proceed B, Cursor Adjustment Process, Flow Chart



●Figure 6012. Buffer Regeneration, Proceed C and Proceed F, Character Mode, Flow Chart



●Figure 6013. Buffer Regeneration, Proceed C and Proceed E, Graphic, Transfer and No Op Modes, Flow Chart

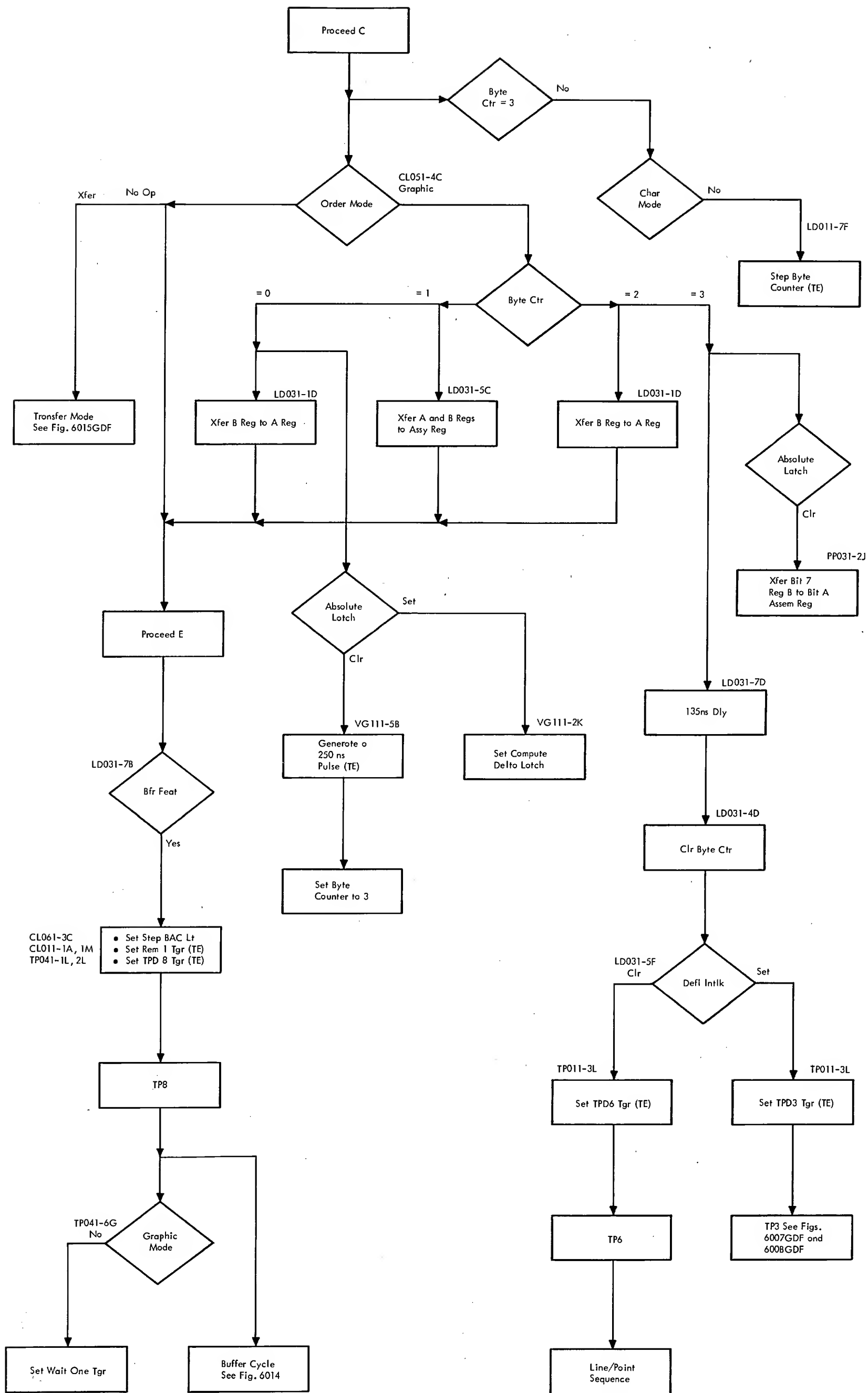
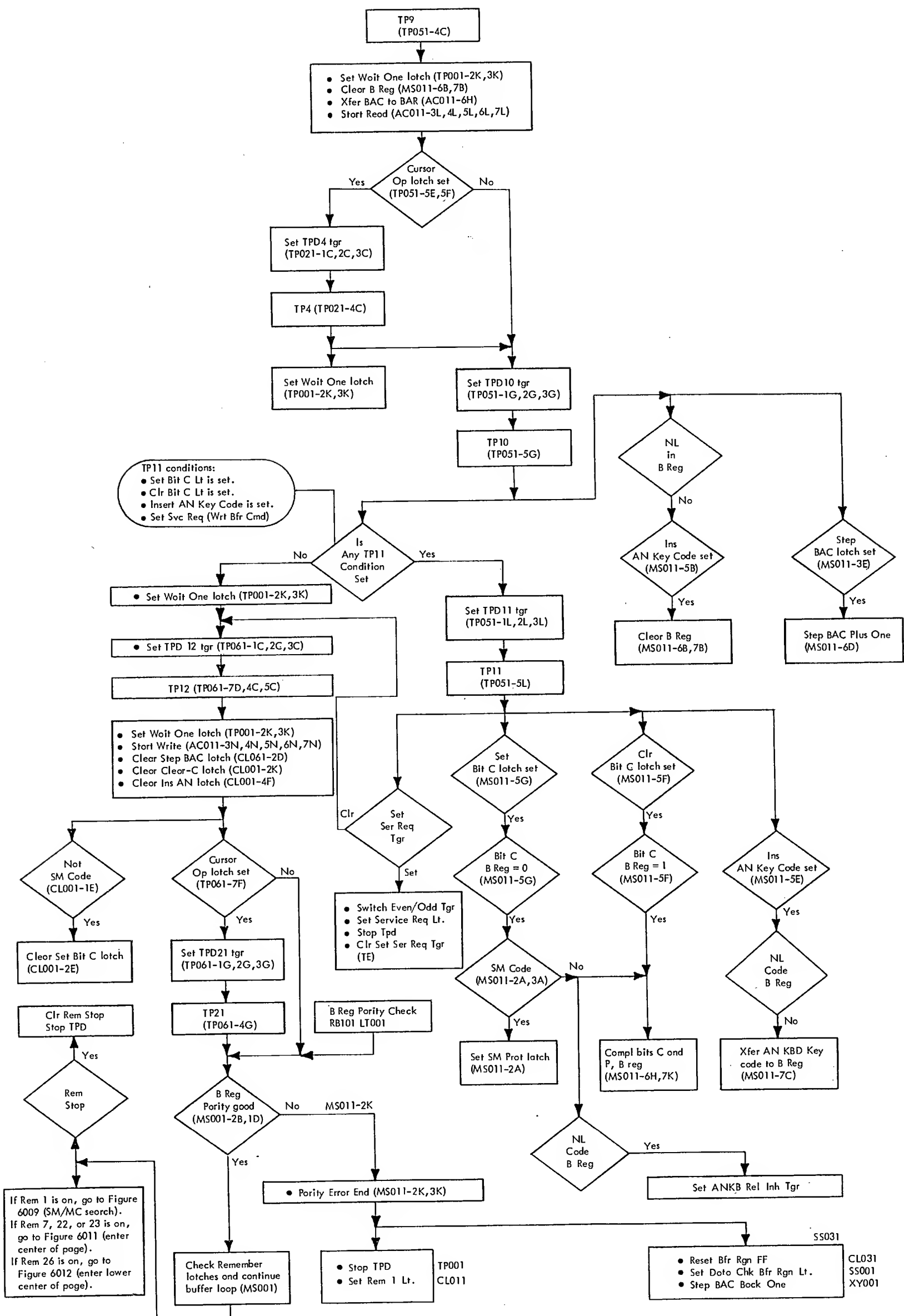


Figure 6013GDF. Buffer Regeneration, Proceed C and Proceed E, Graphic, Transfer and No Op Modes, Flow Chart (for GDF Machines)



•Figure 6014. Buffer Regeneration, Buffer Cycle, Flow Chart

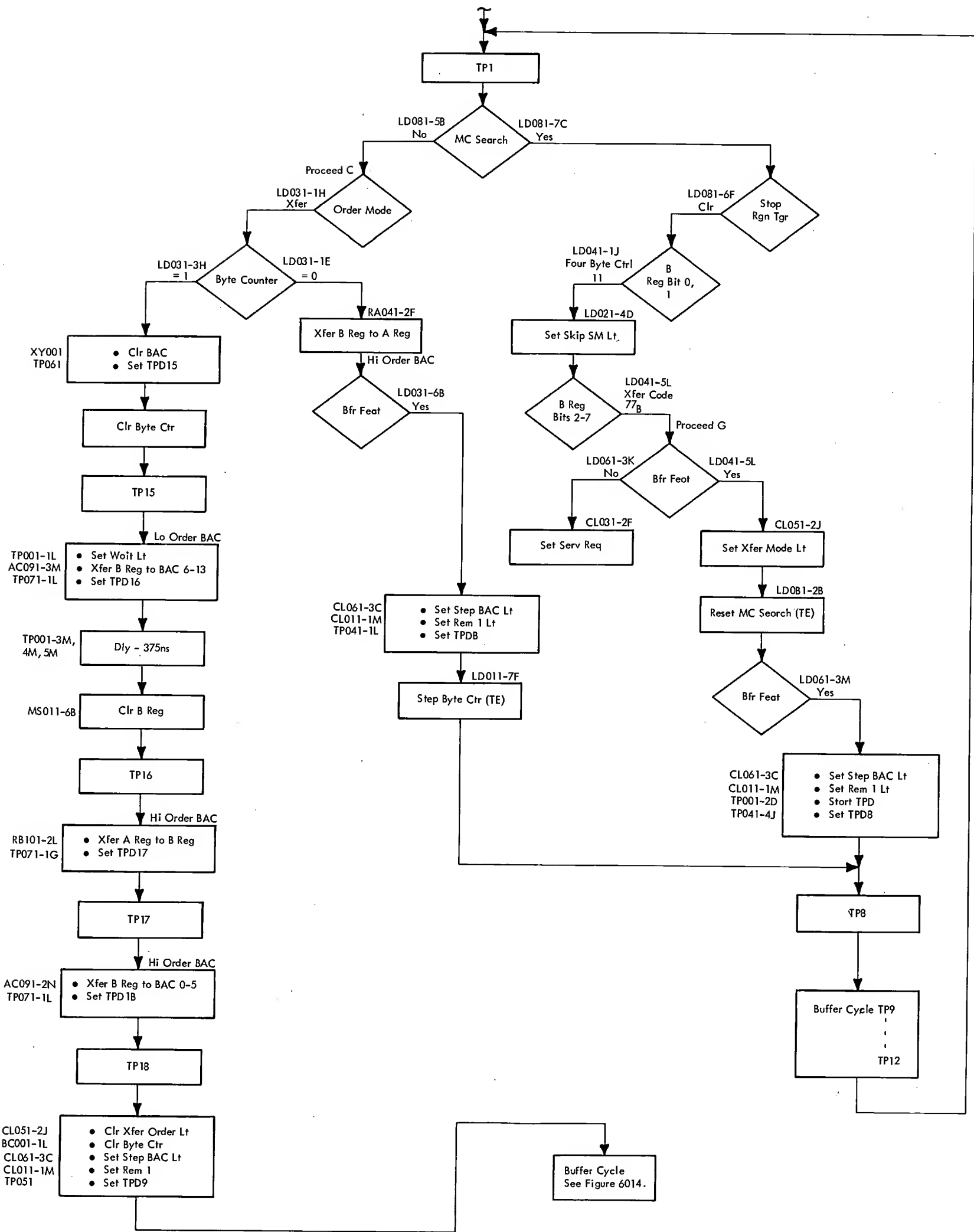


Figure 6015. Buffer Regeneration, Transfer Order Process, Flow Chart

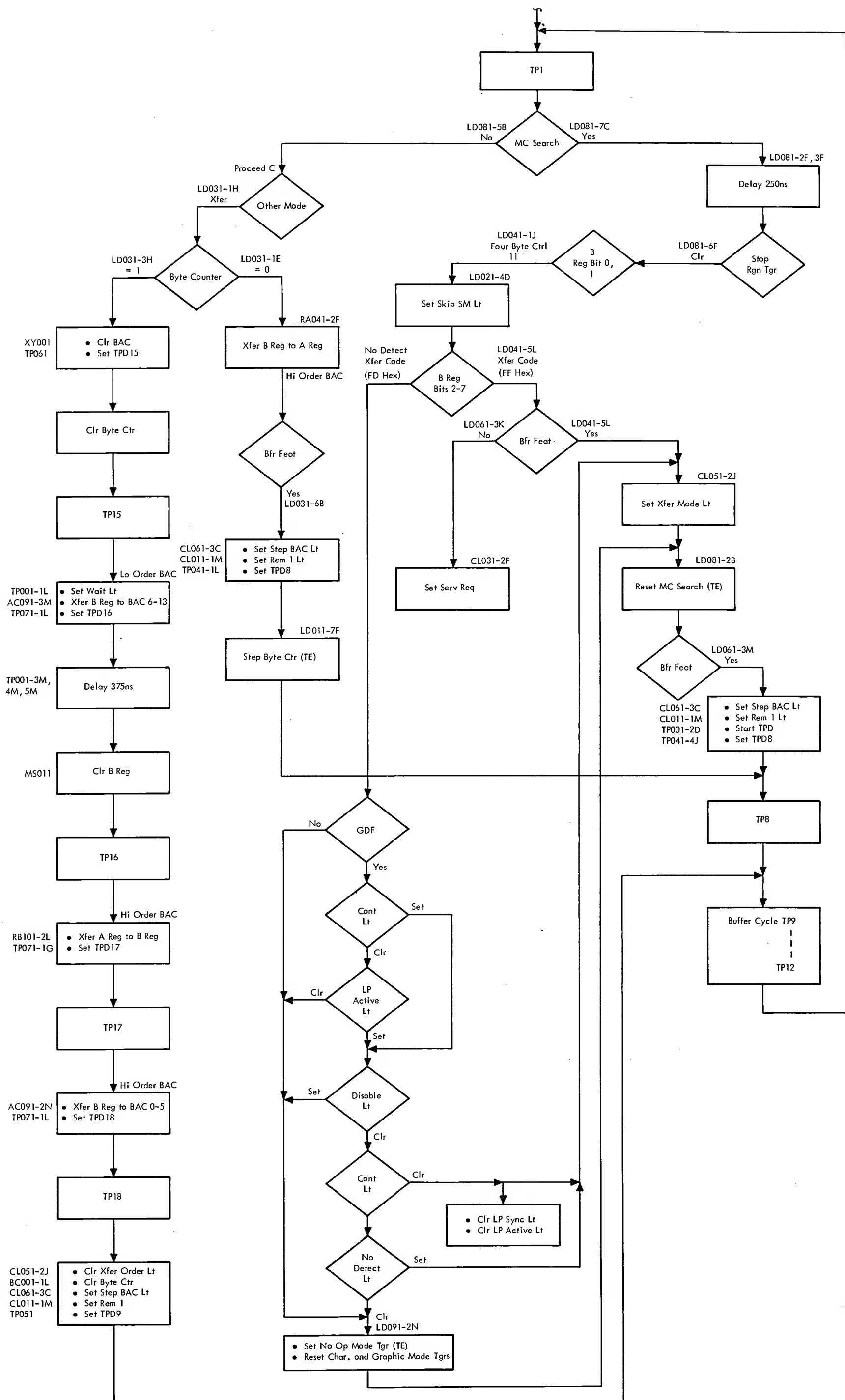


Figure 6015GDF. Buffer Regeneration, Transfer Order Process, Flow Chart (for GDF Machines)

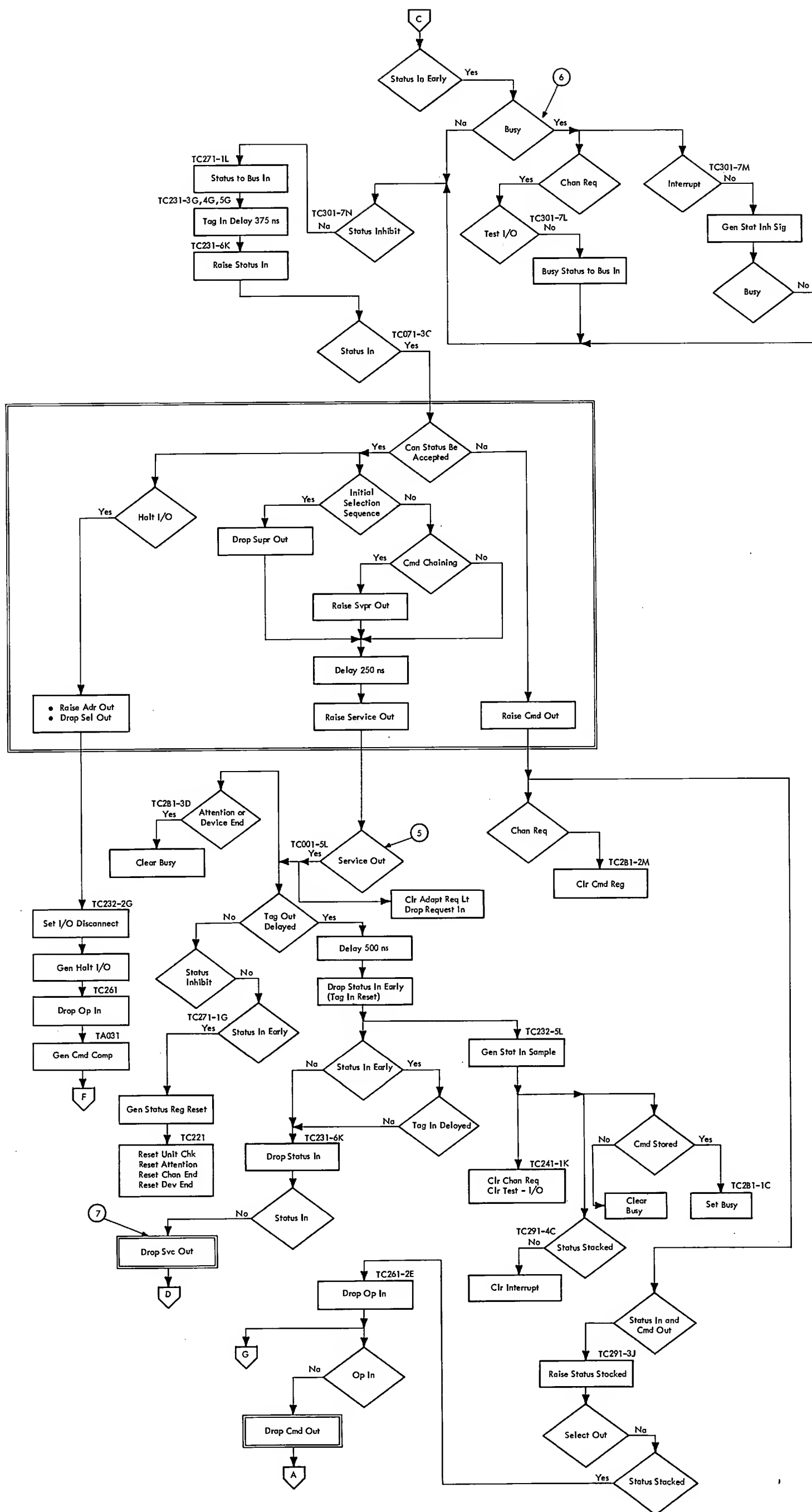


Figure 6016. Transmission Interface Control, Initial Selection Sequence, Flow Chart (Sheet 3 of 4)

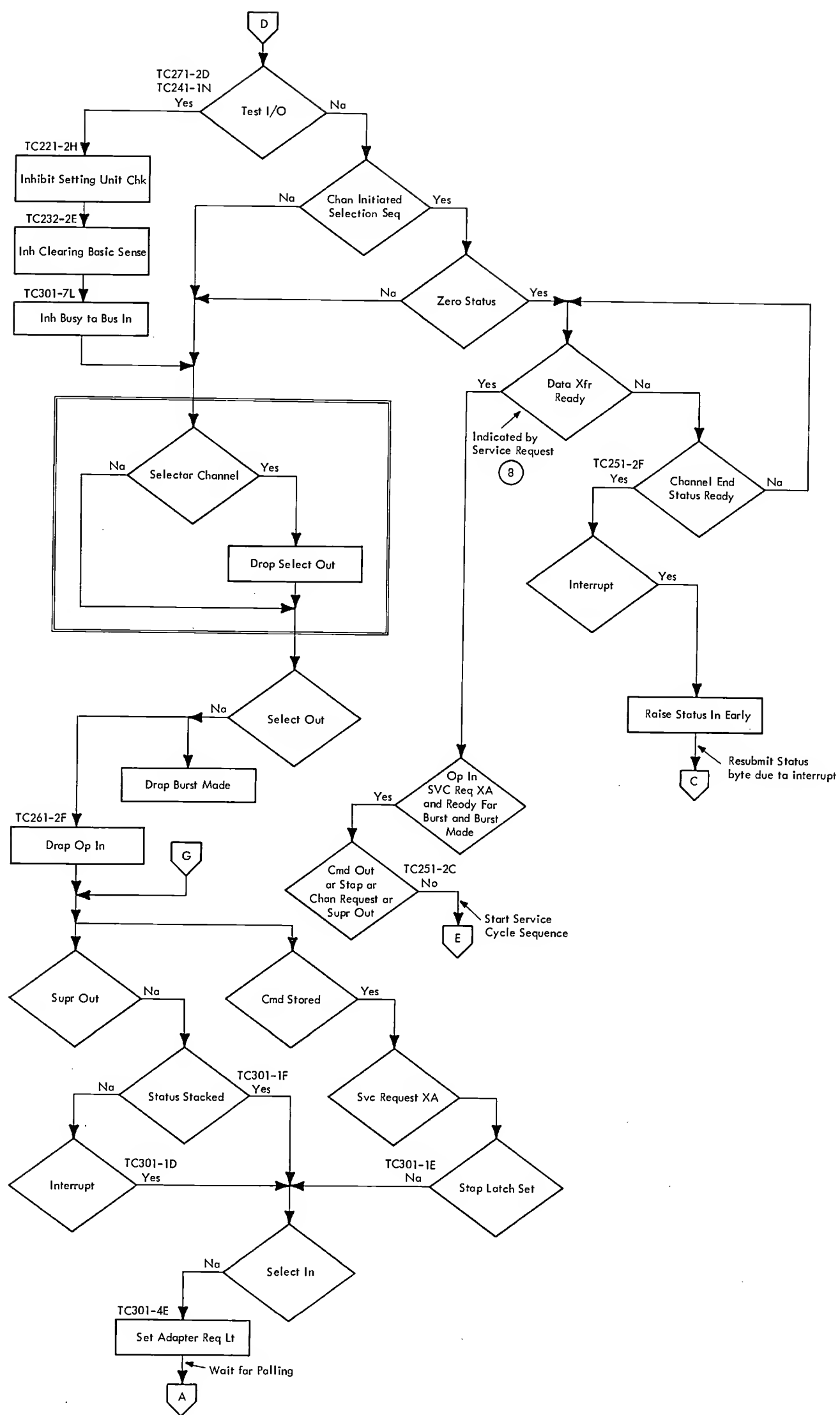


Figure 6016. Transmission Interface Control, Initial Selection Sequence, Flow Chart (Sheet 4 of 4)

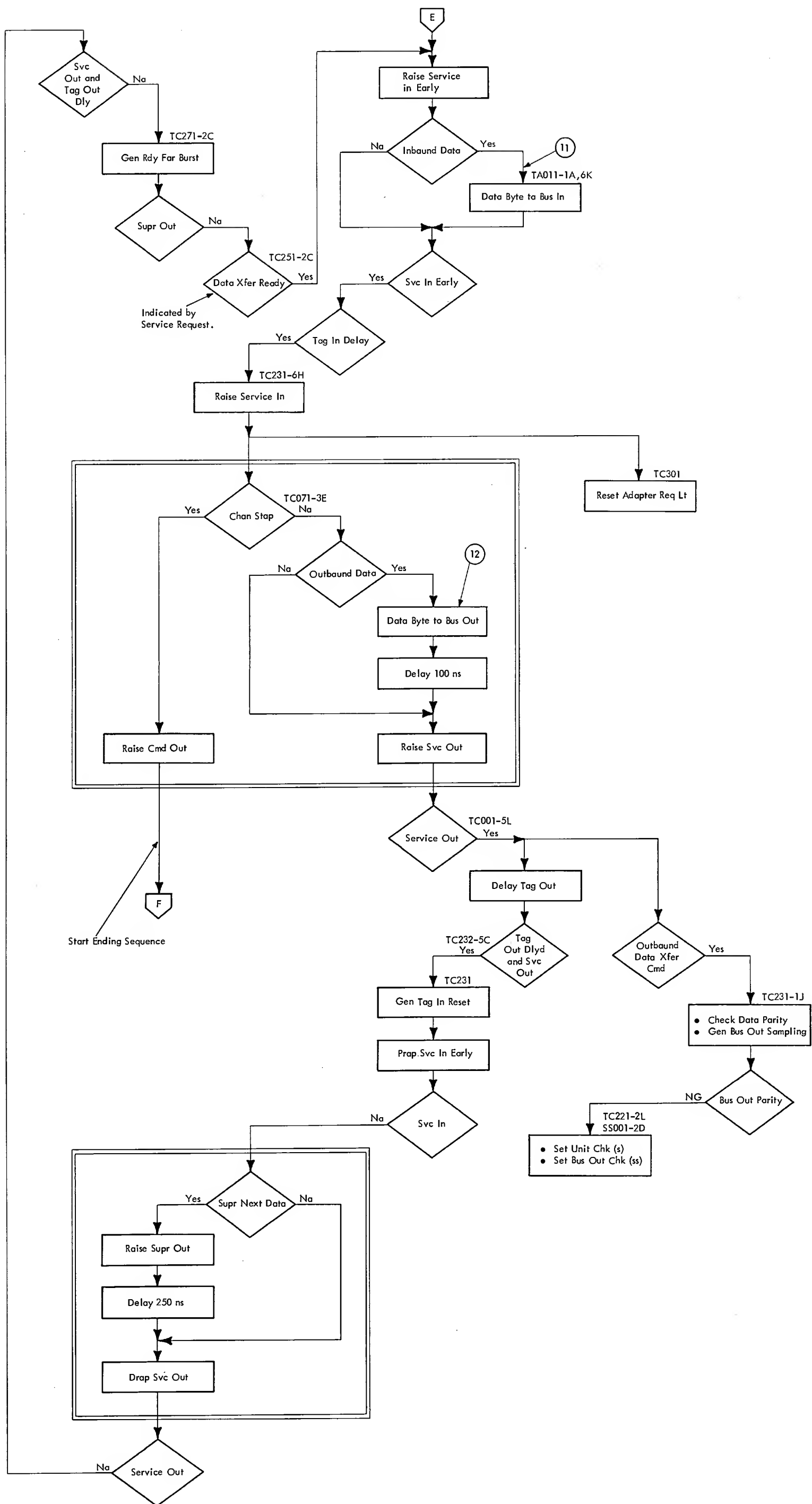


Figure 6017. Transmission Interface Control, Service Cycle Sequence, Flow Chart

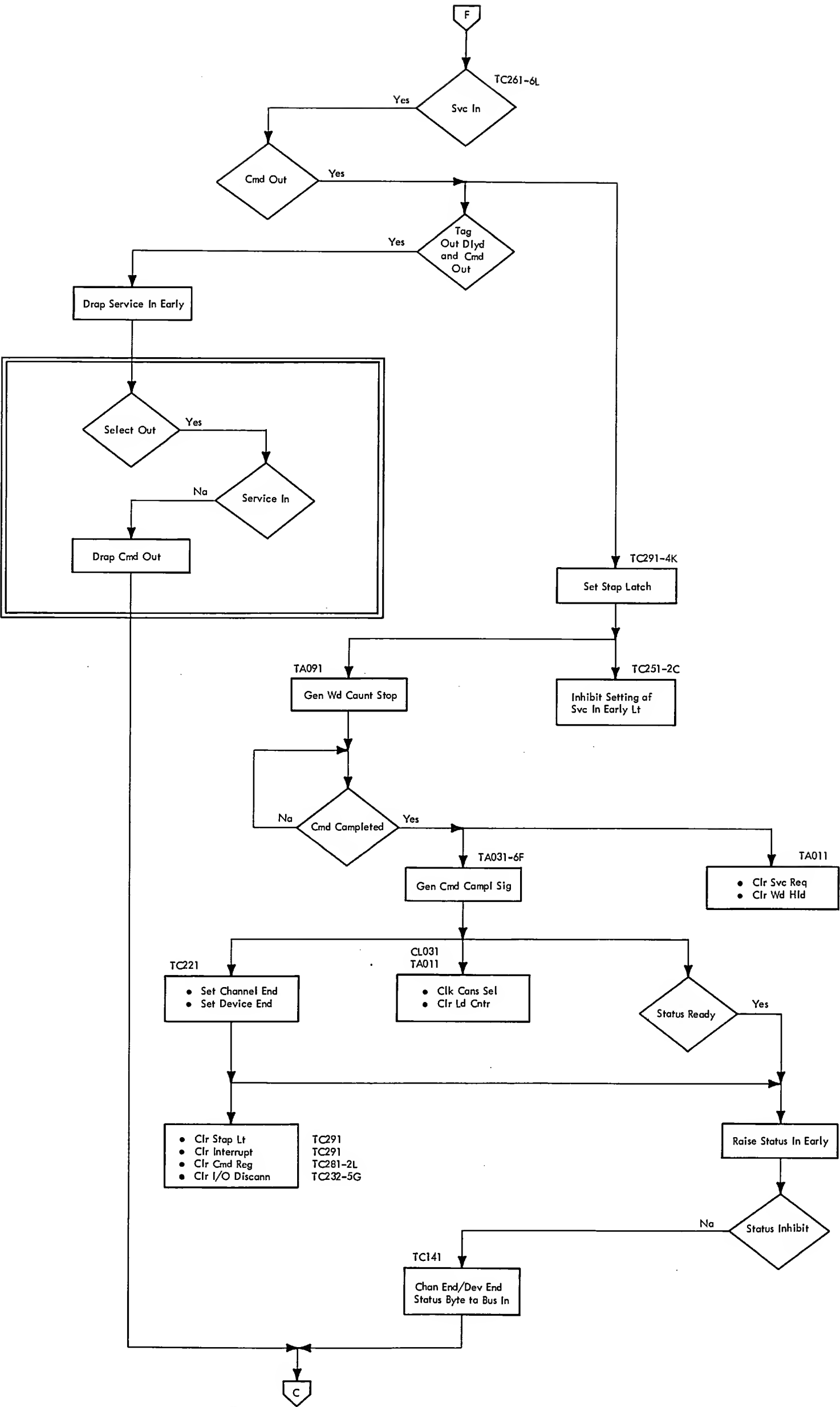


Figure 6018. Transmission Interface Control, Ending Sequence, Flow Chart

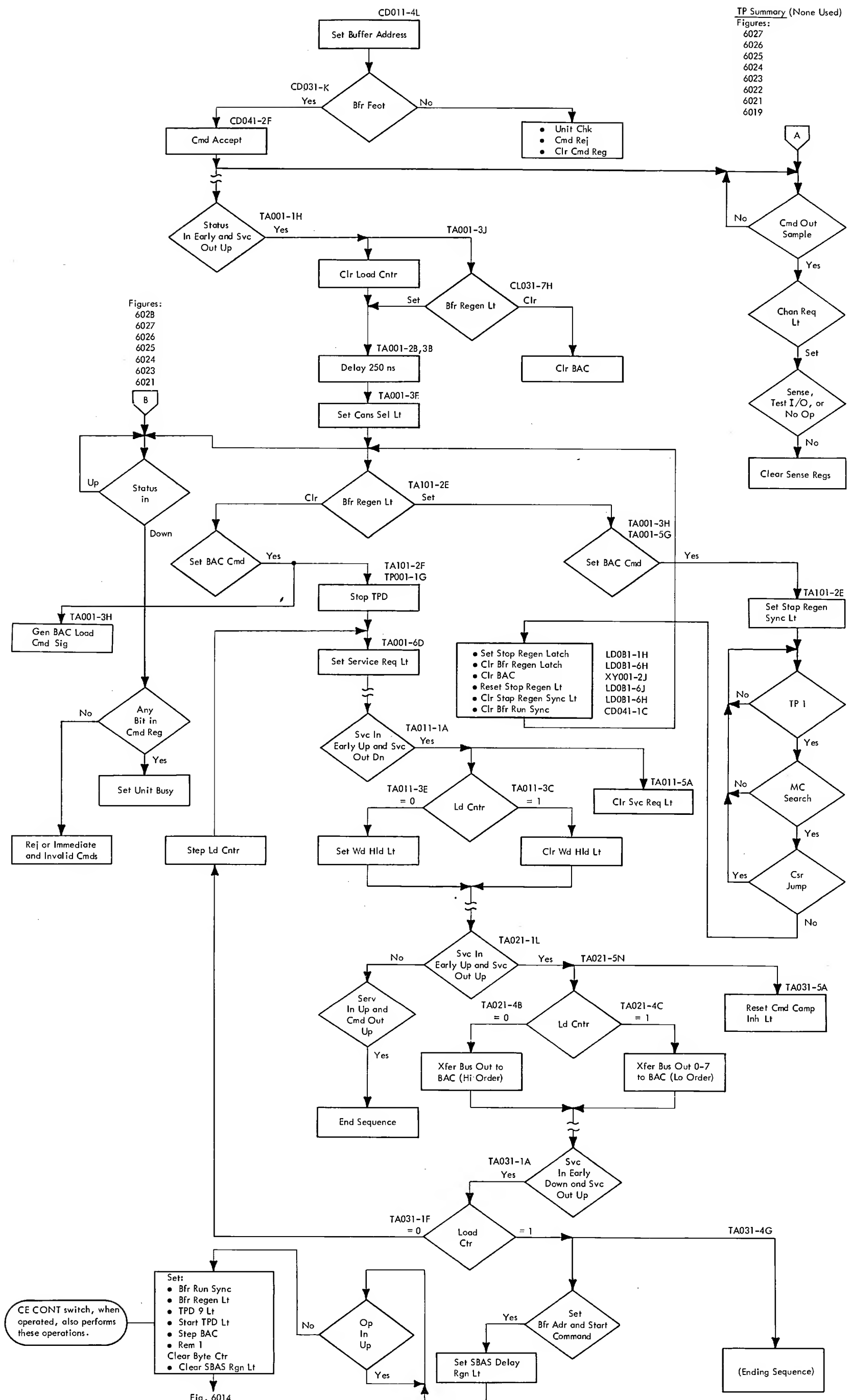


Figure 6019. Set Buffer Address Command, Flow Chart

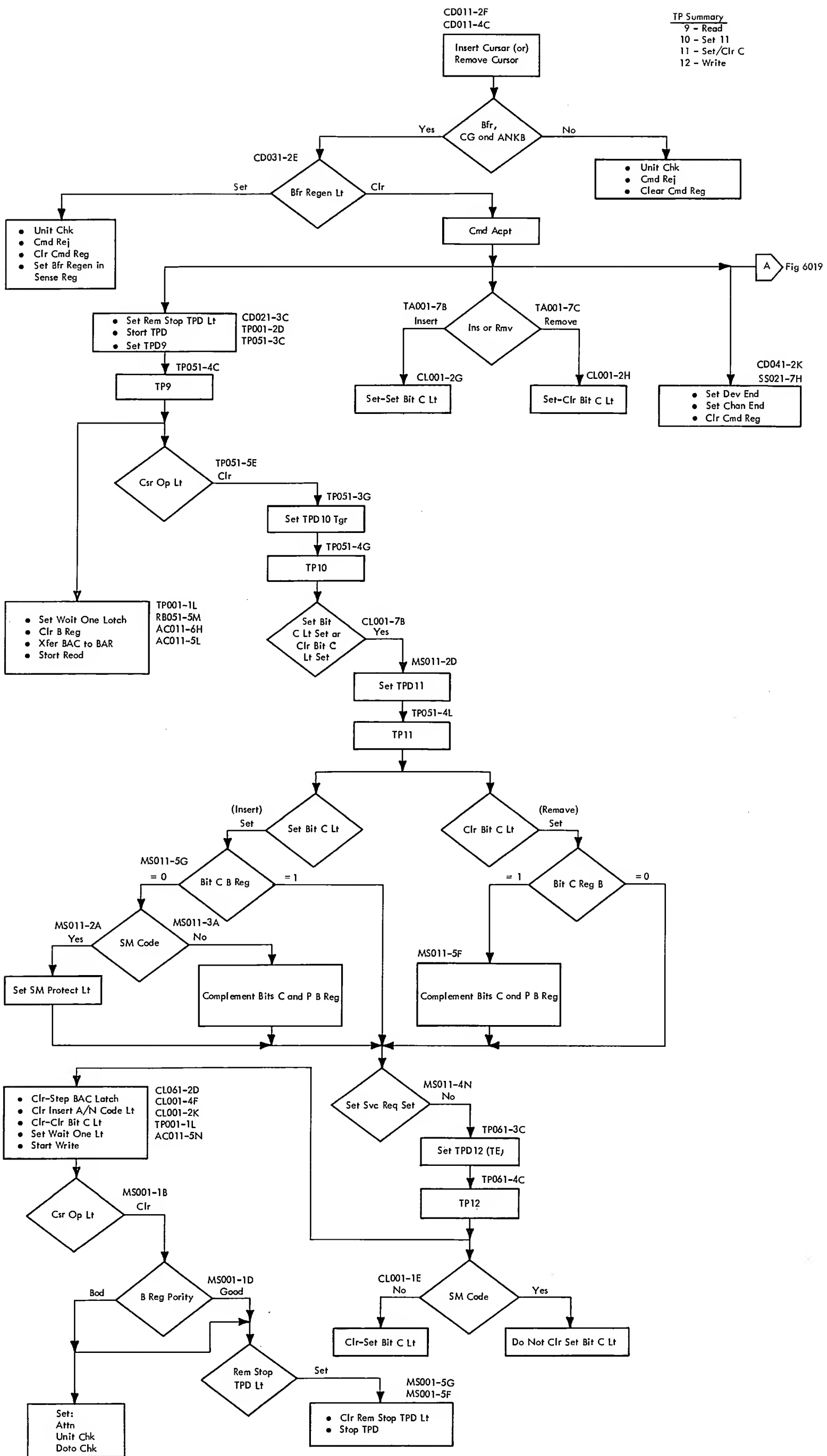


Figure 6020. Insert-Remove Cursor Command, Flow Chart

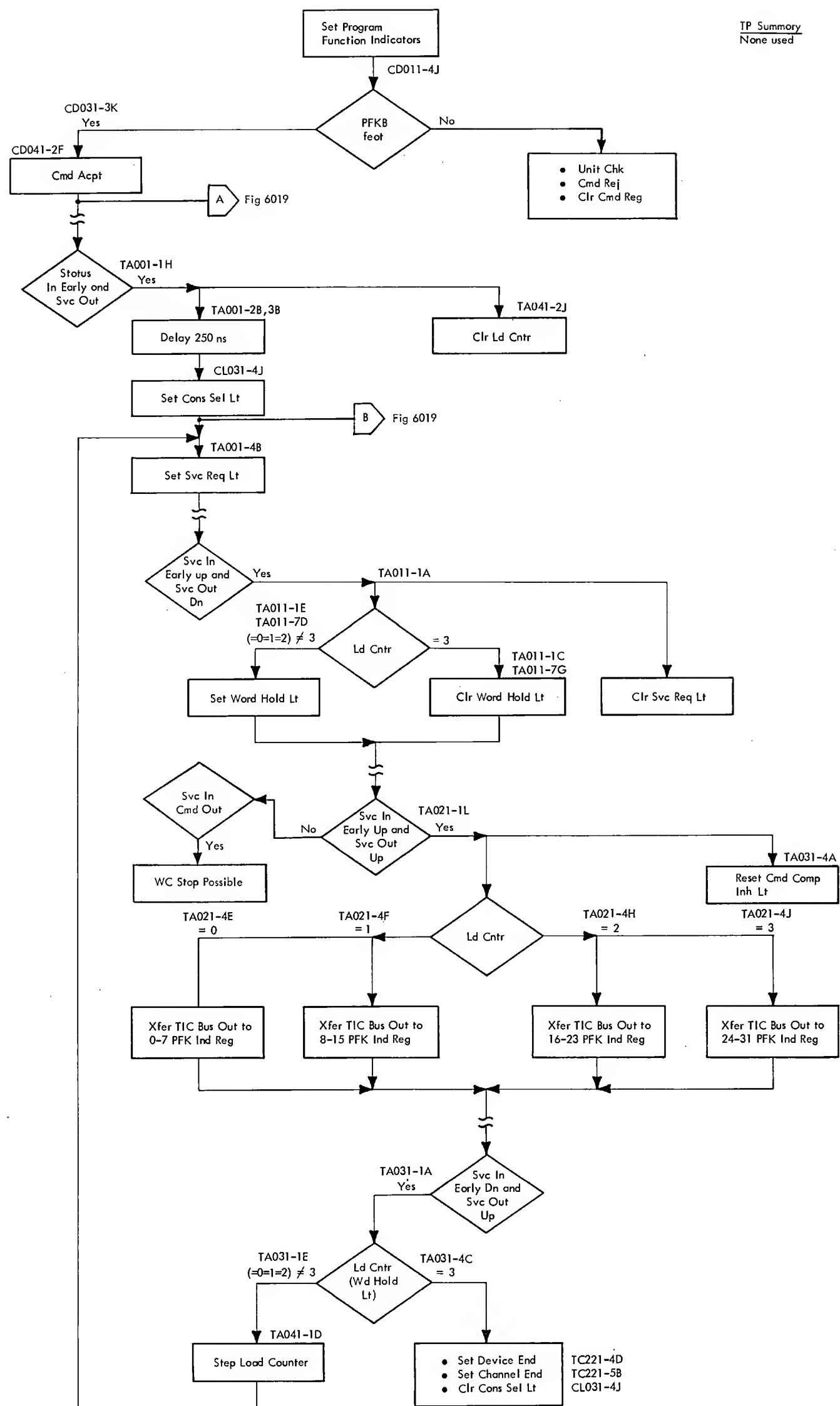


Figure 6021. Set Program Function Keyboard Indicators Command, Flow Chart

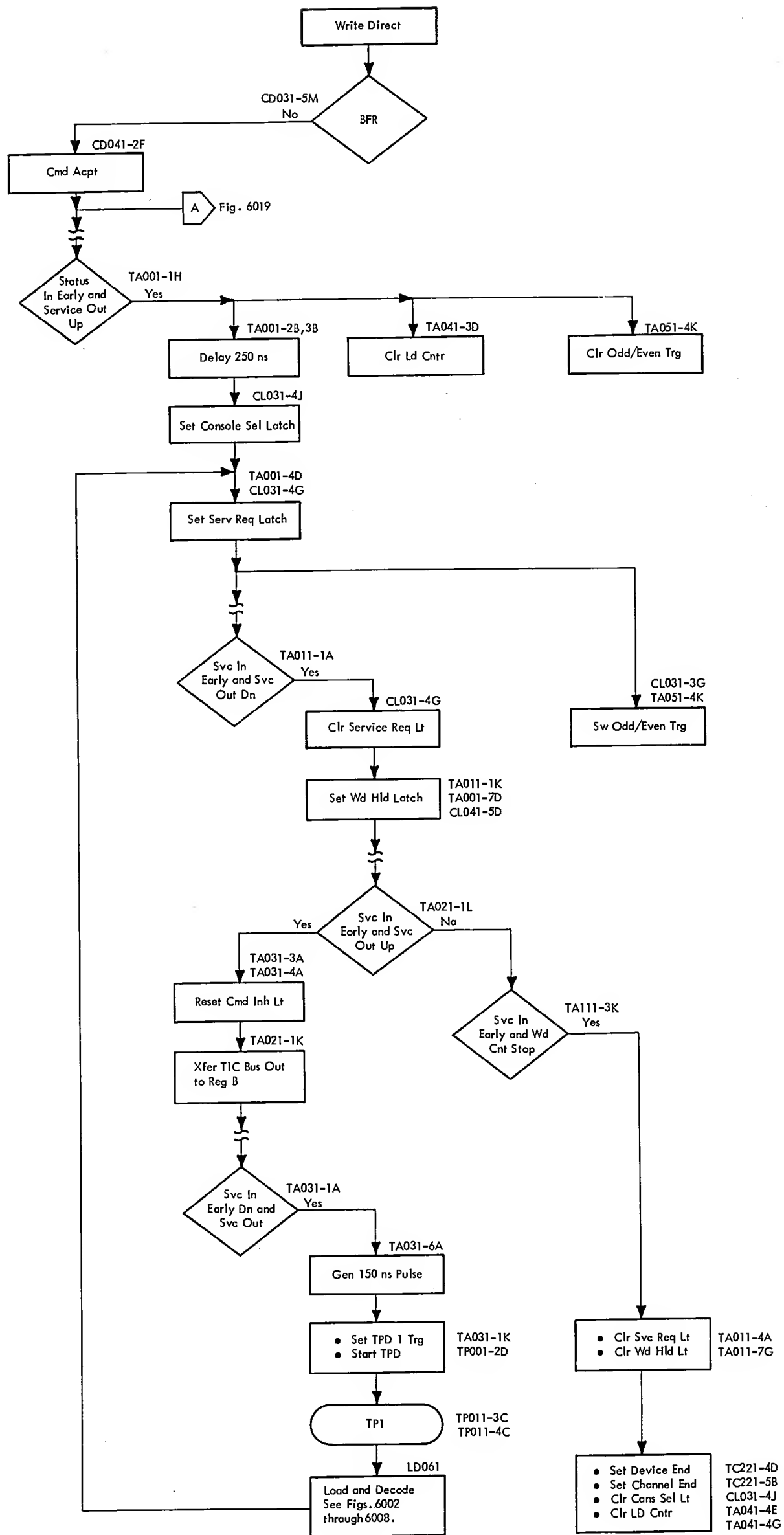


Figure 6022. Write Direct Command, Flow Chart

13 - Set Svc Req.

●Figure 6023. Write Buffer Command, Flow Chart



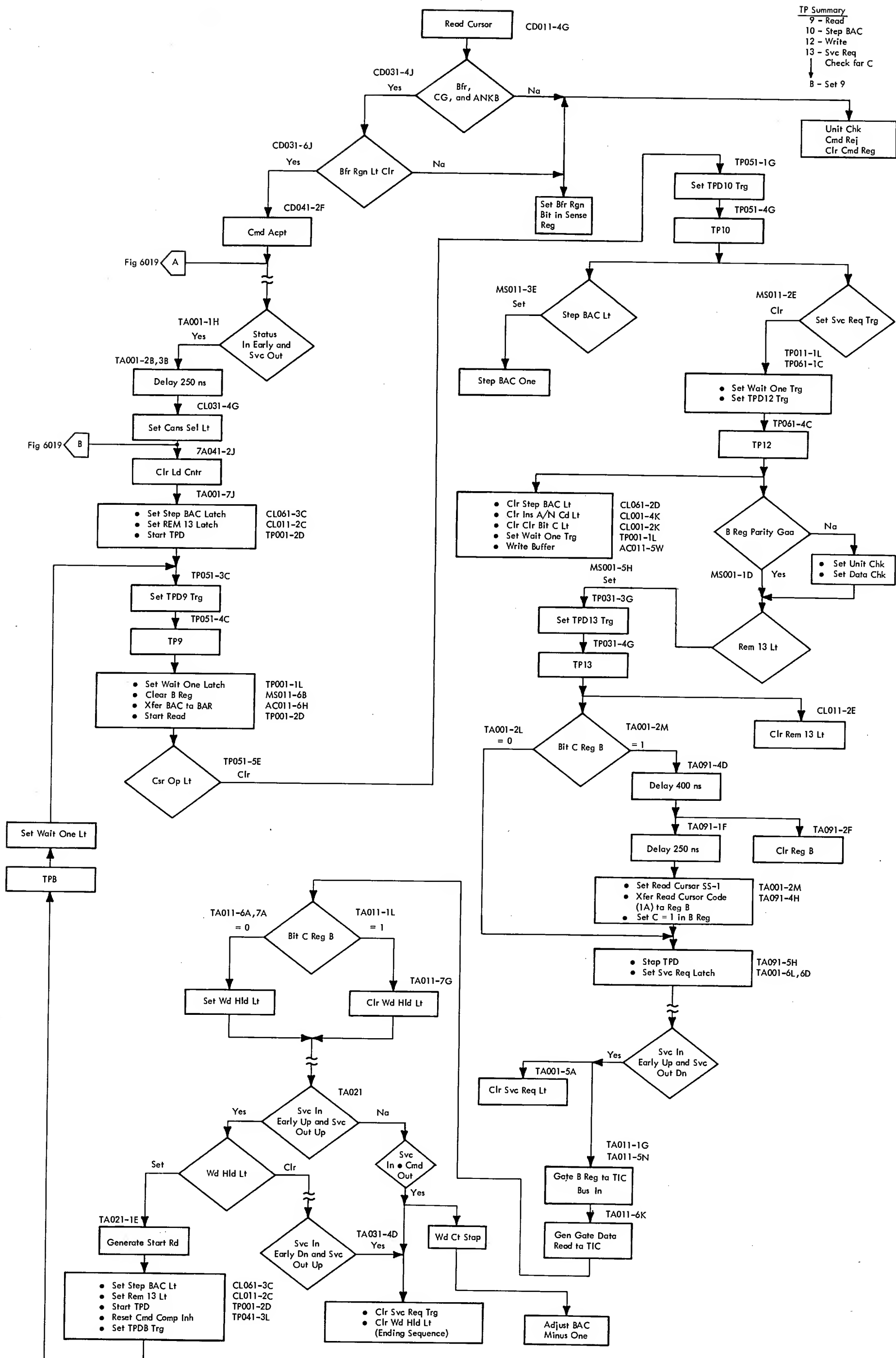


Figure 6025. Read Cursor Command, Flow Chart

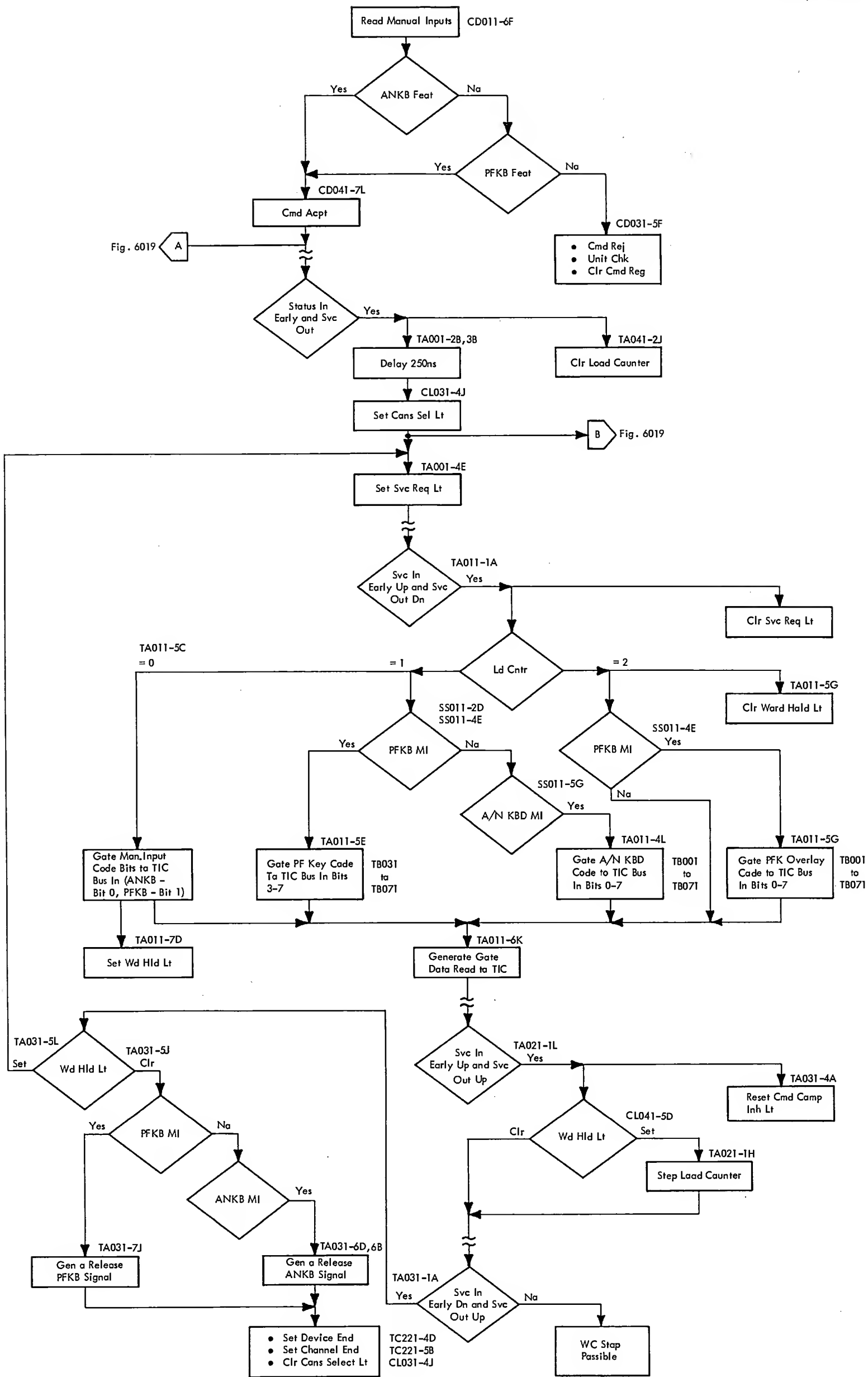


Figure 6026. Read Manual Inputs Command, Flow Chart

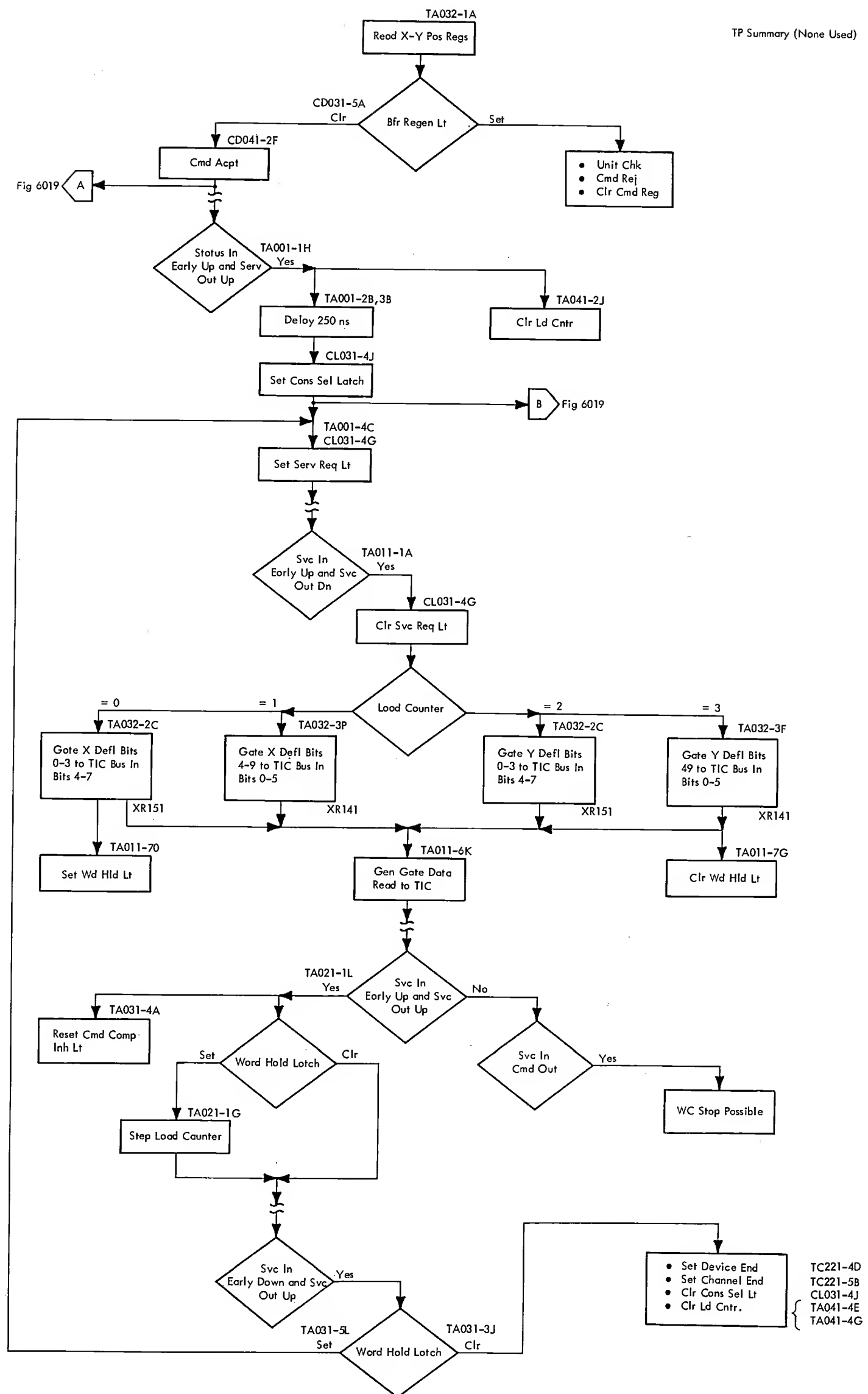


Figure 6027. Read X-Y Position Registers Command, Flow Chart

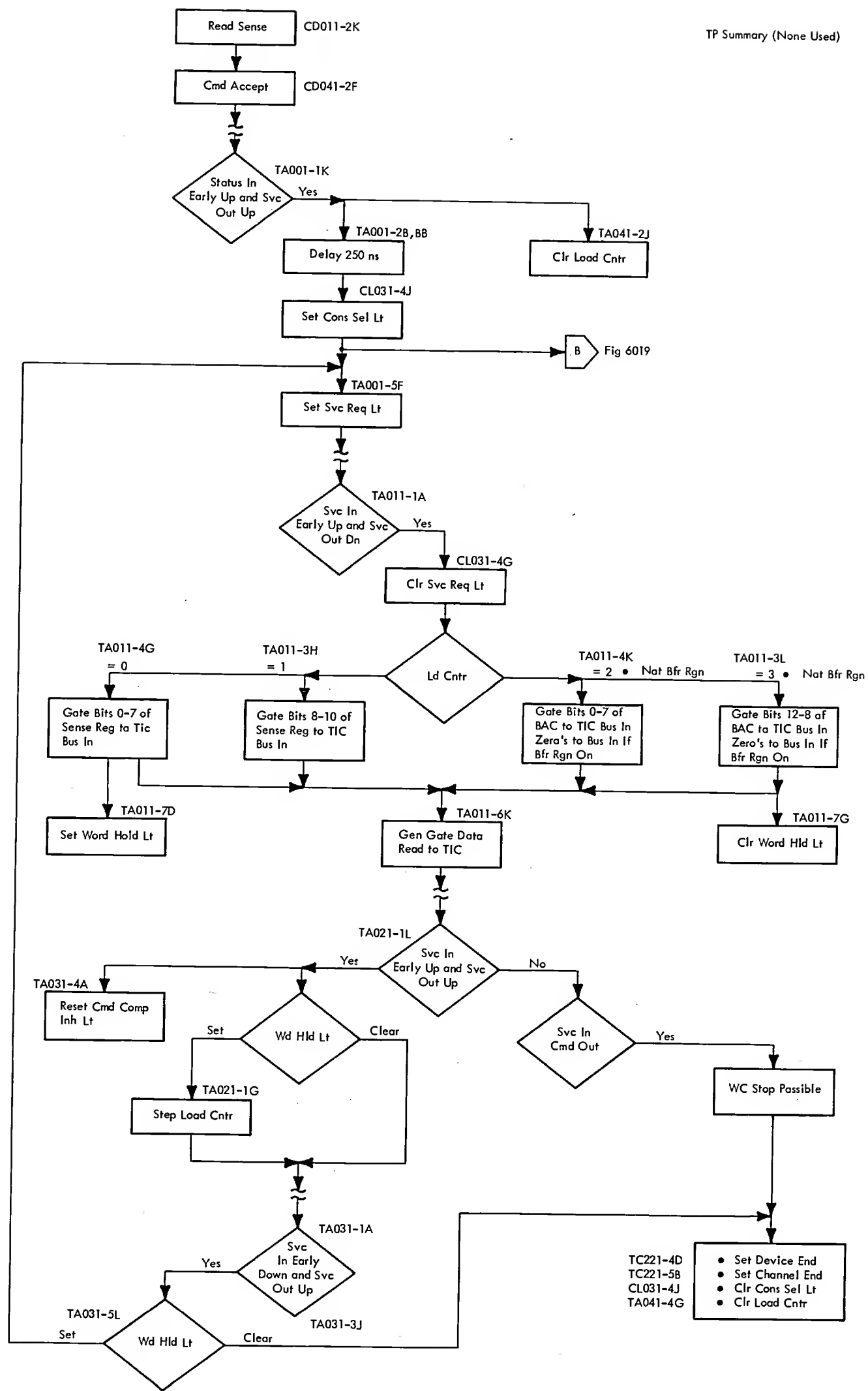


Figure 6028. Sense Command, Flow Chart

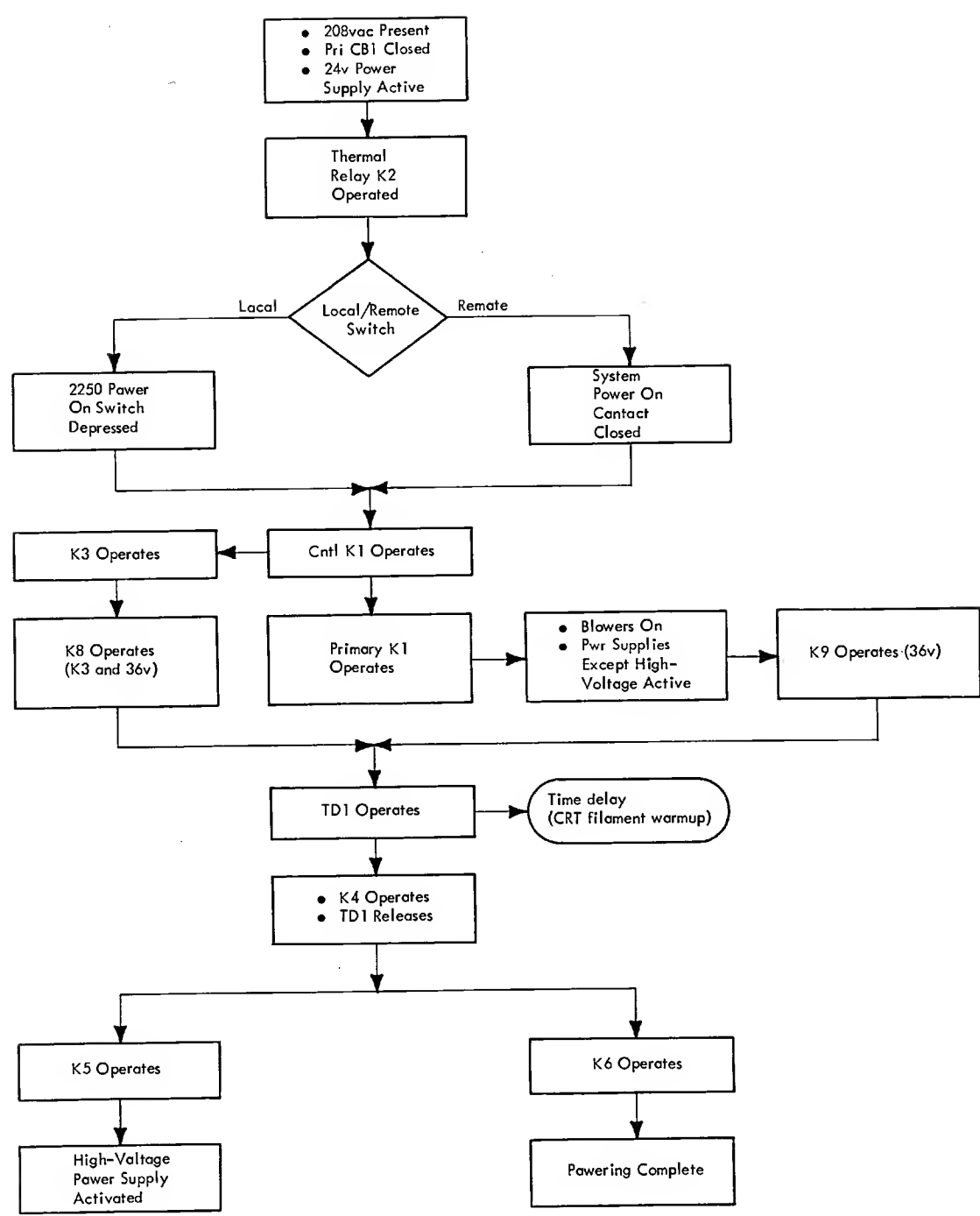


Figure 6029. Power On Sequence

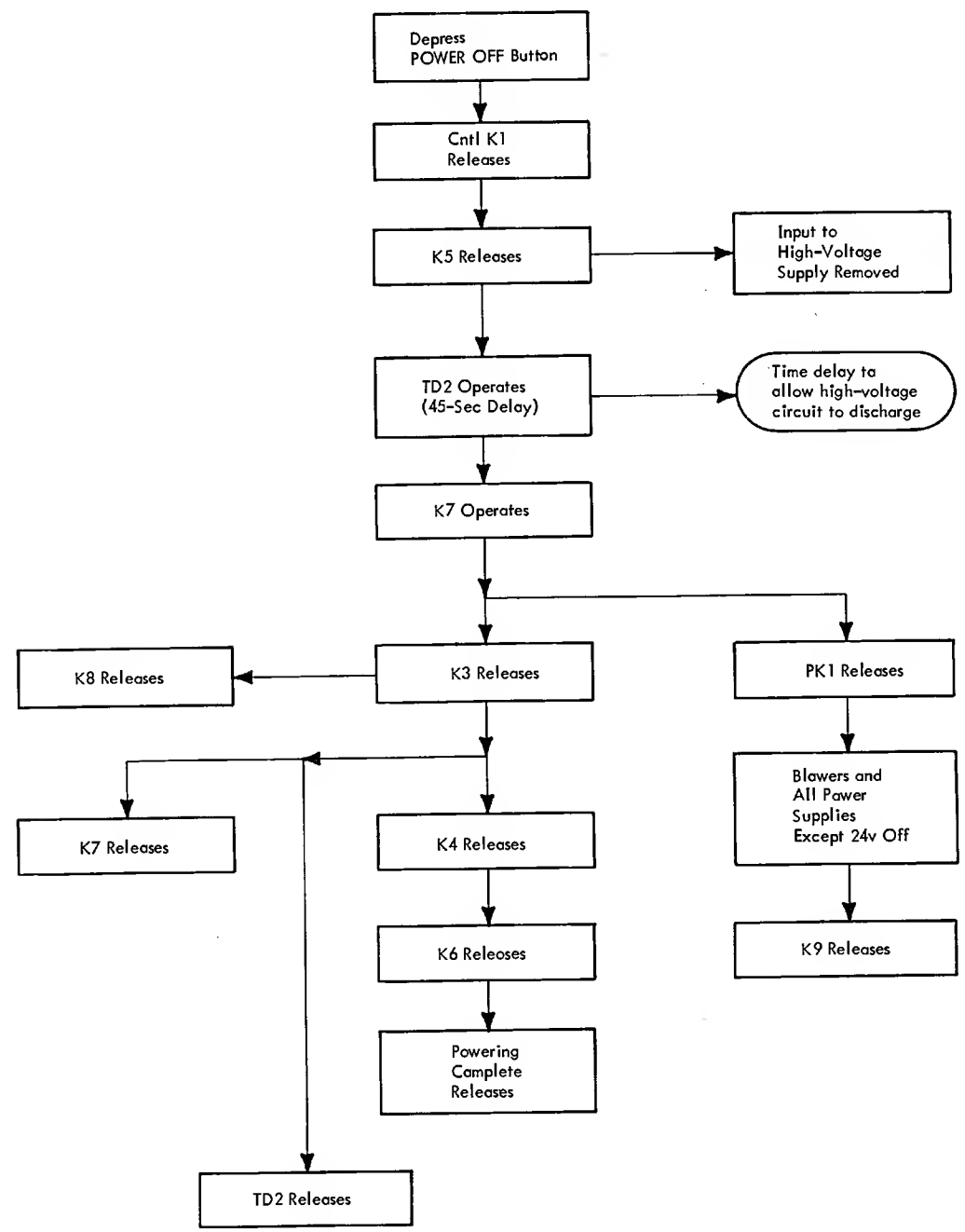


Figure 6030. Power Off Sequence

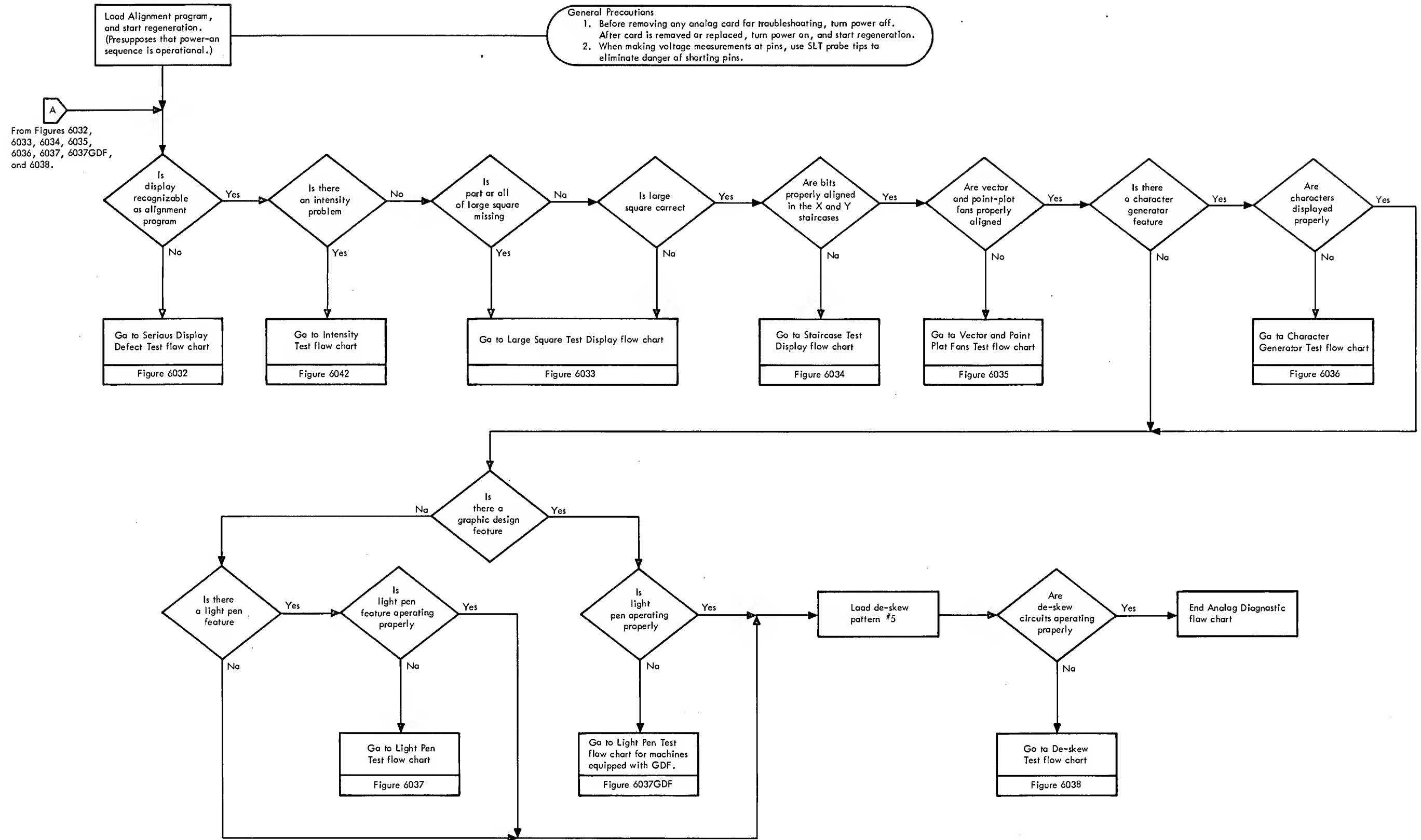


Figure 6031. Analog Diagnostic Master Flow Chart

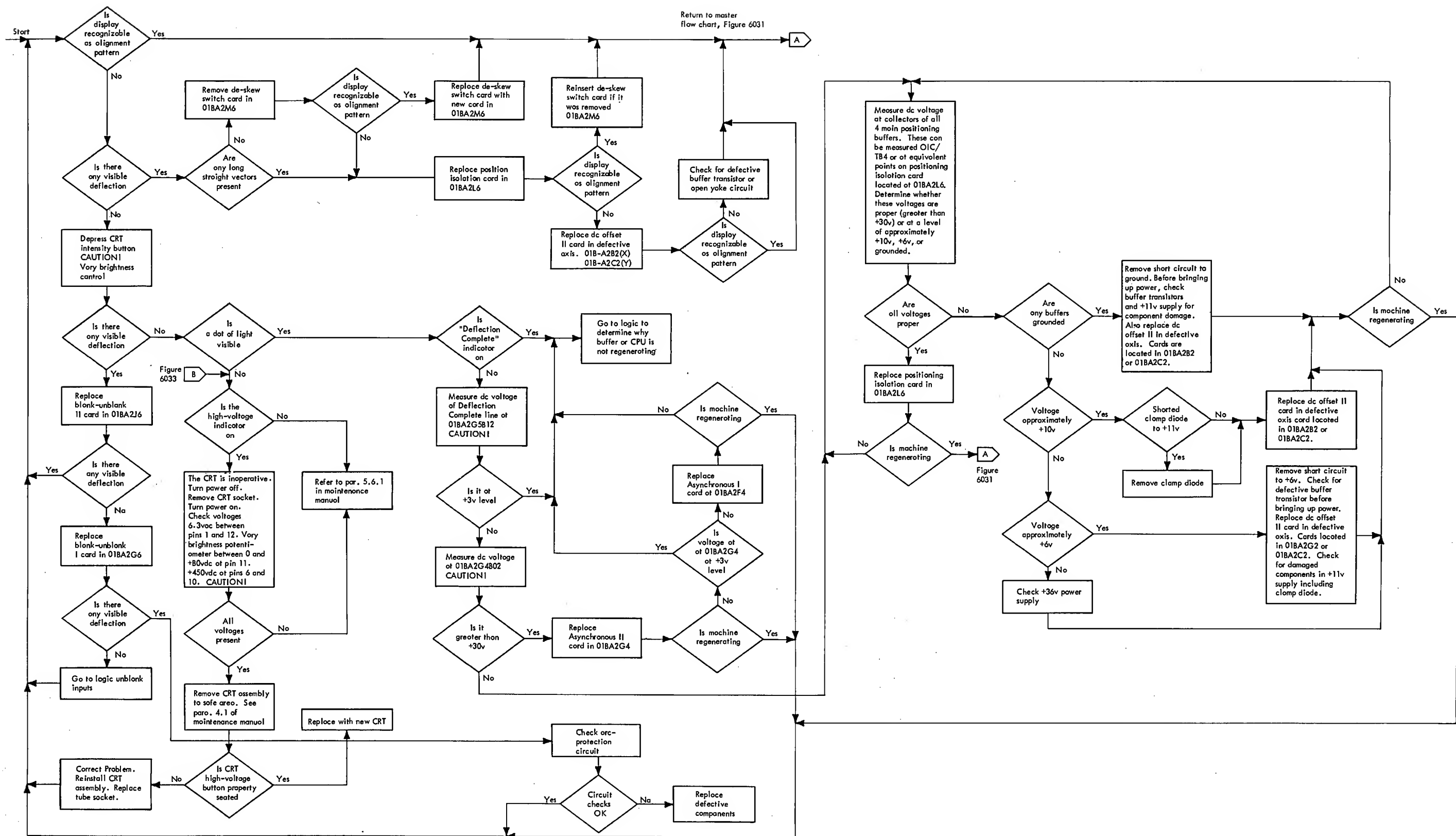


Figure 6032. Serious Display Defect Test Flow Charts

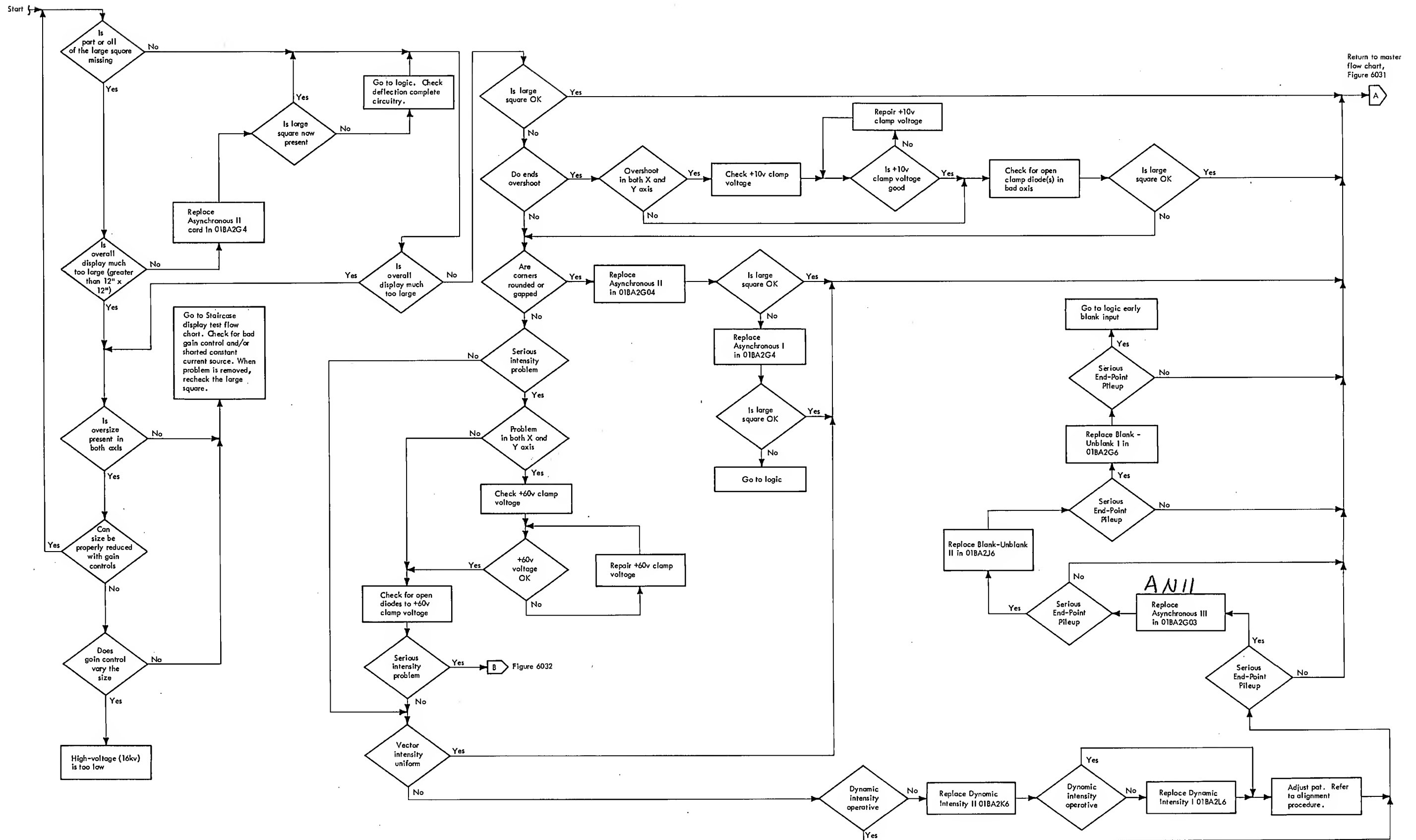


Figure 6033. Large Square Test Display Flow Chart

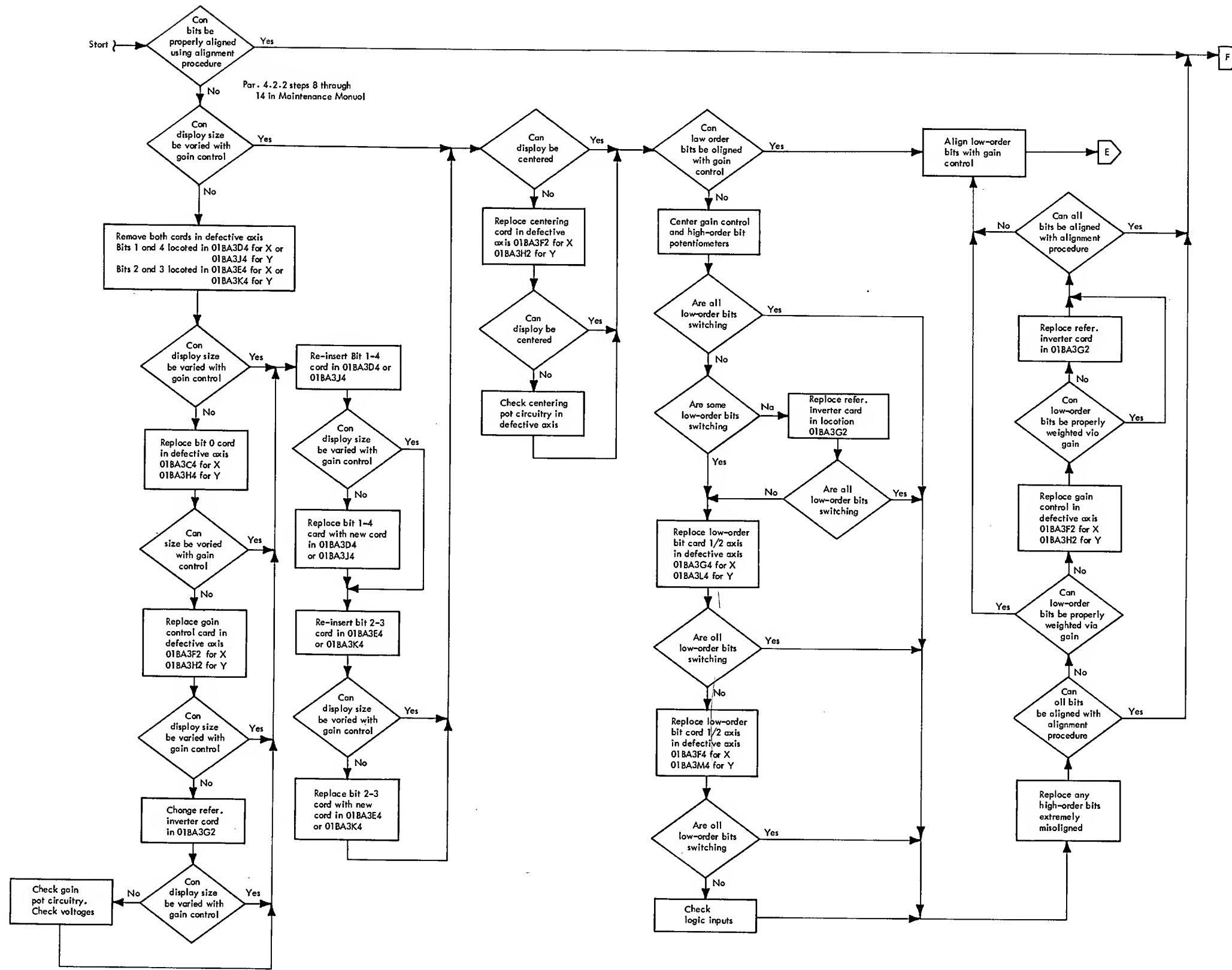


Figure 6034. Staircase Test Display Flow Chart (Sheet 1 of 2)

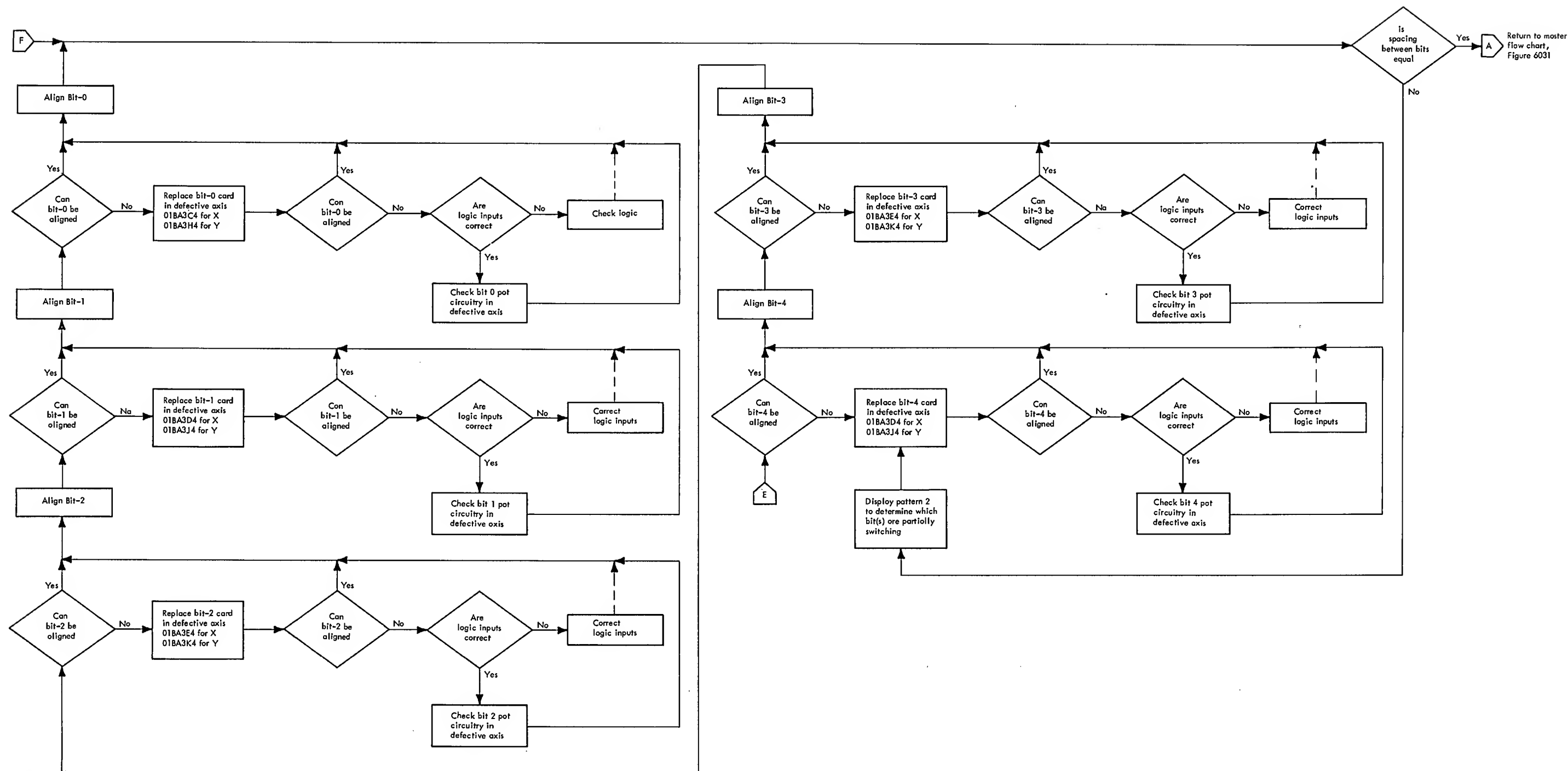


Figure 6034. Staircase Test Display Flow Chart (Sheet 2 of 2)

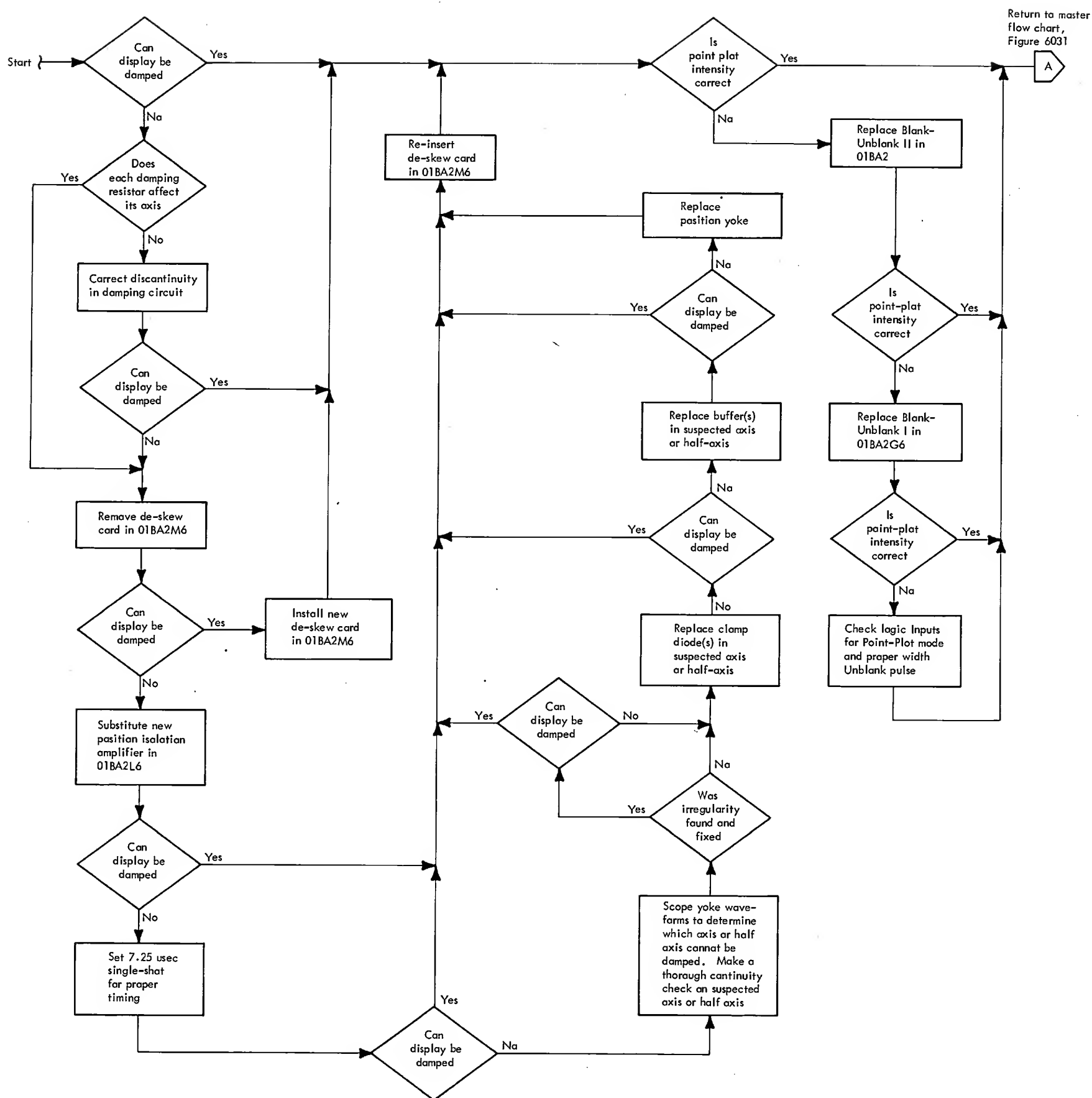


Figure 6035. Vector and Point Plot Fans Test Display Flow Chart

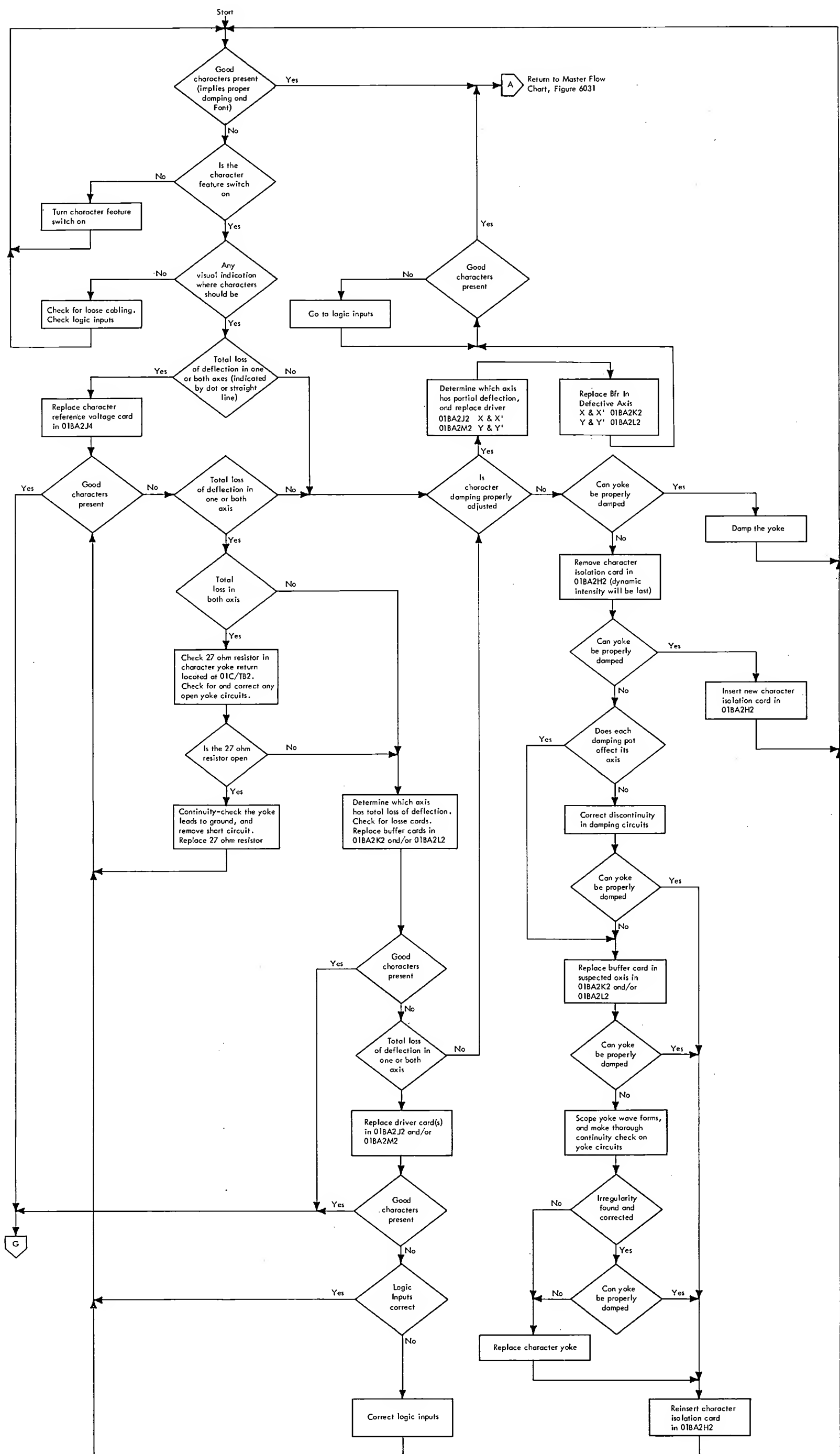


Figure 6036. Character Generator Test Flow Chart (Sheet 1 of 2)

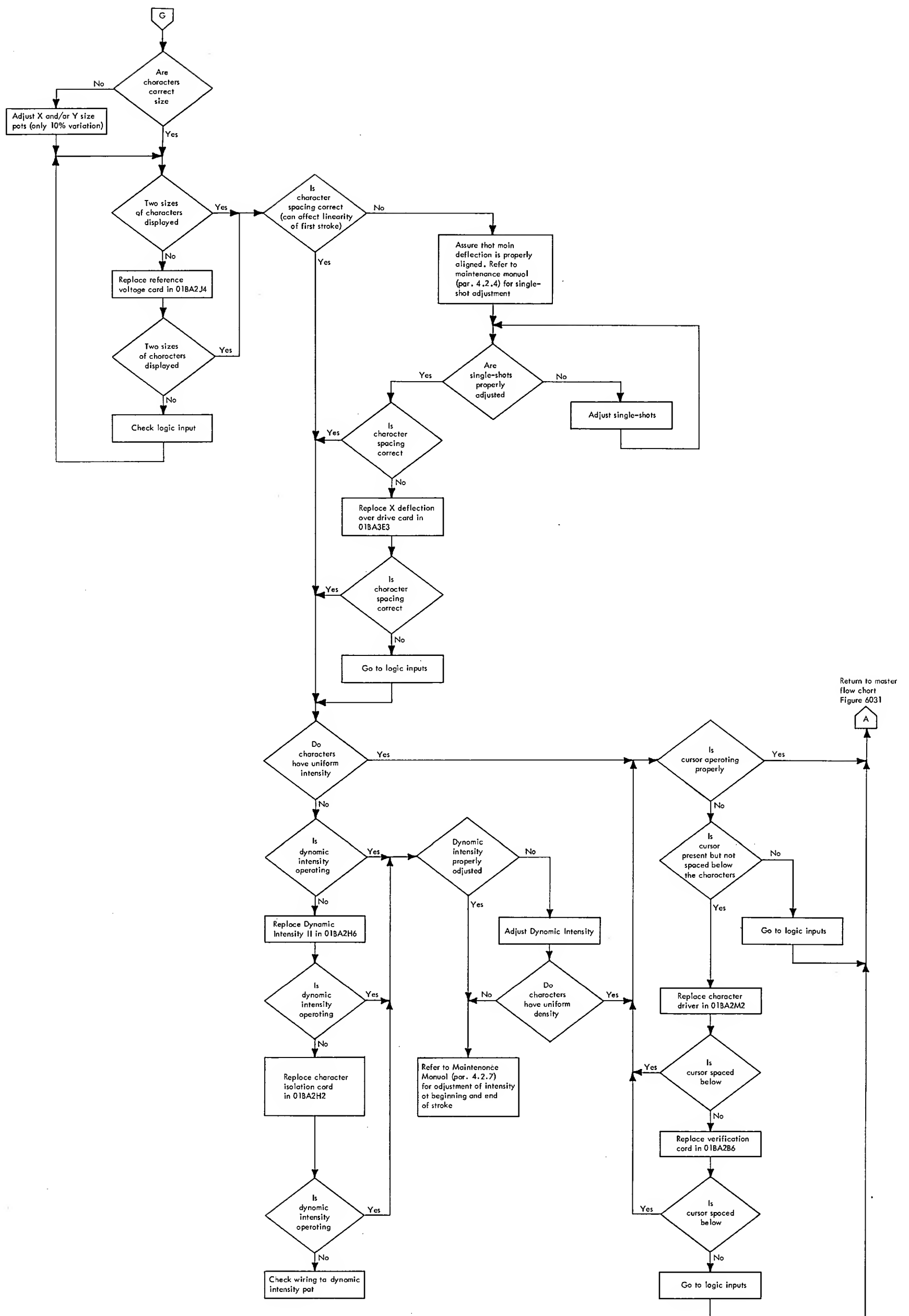


Figure 6036. Character Generator Test Flow Chart (Sheet 2 of 2)

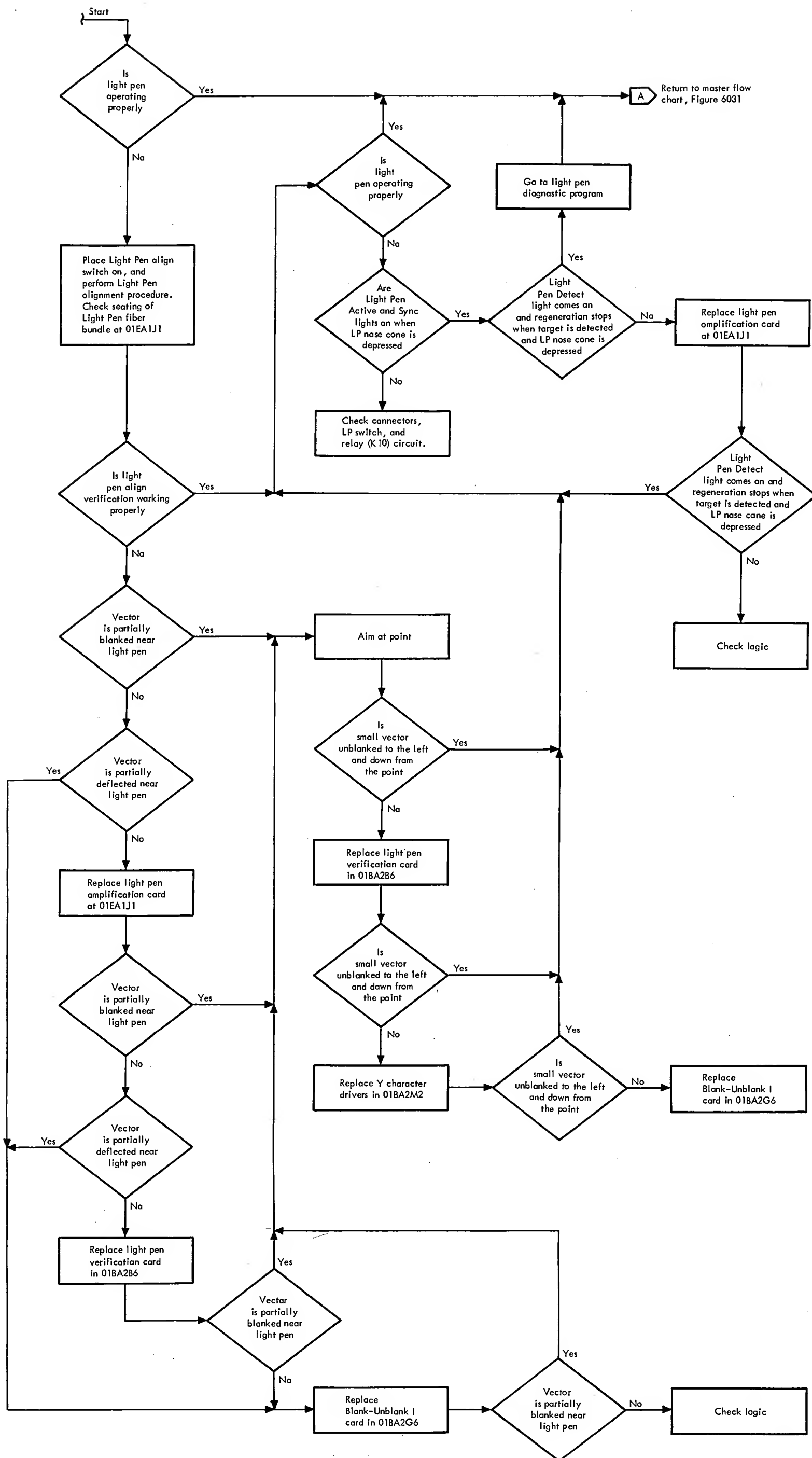


Figure 6037GDF. Light Pen Test Flow Chart (for GDF Machines)

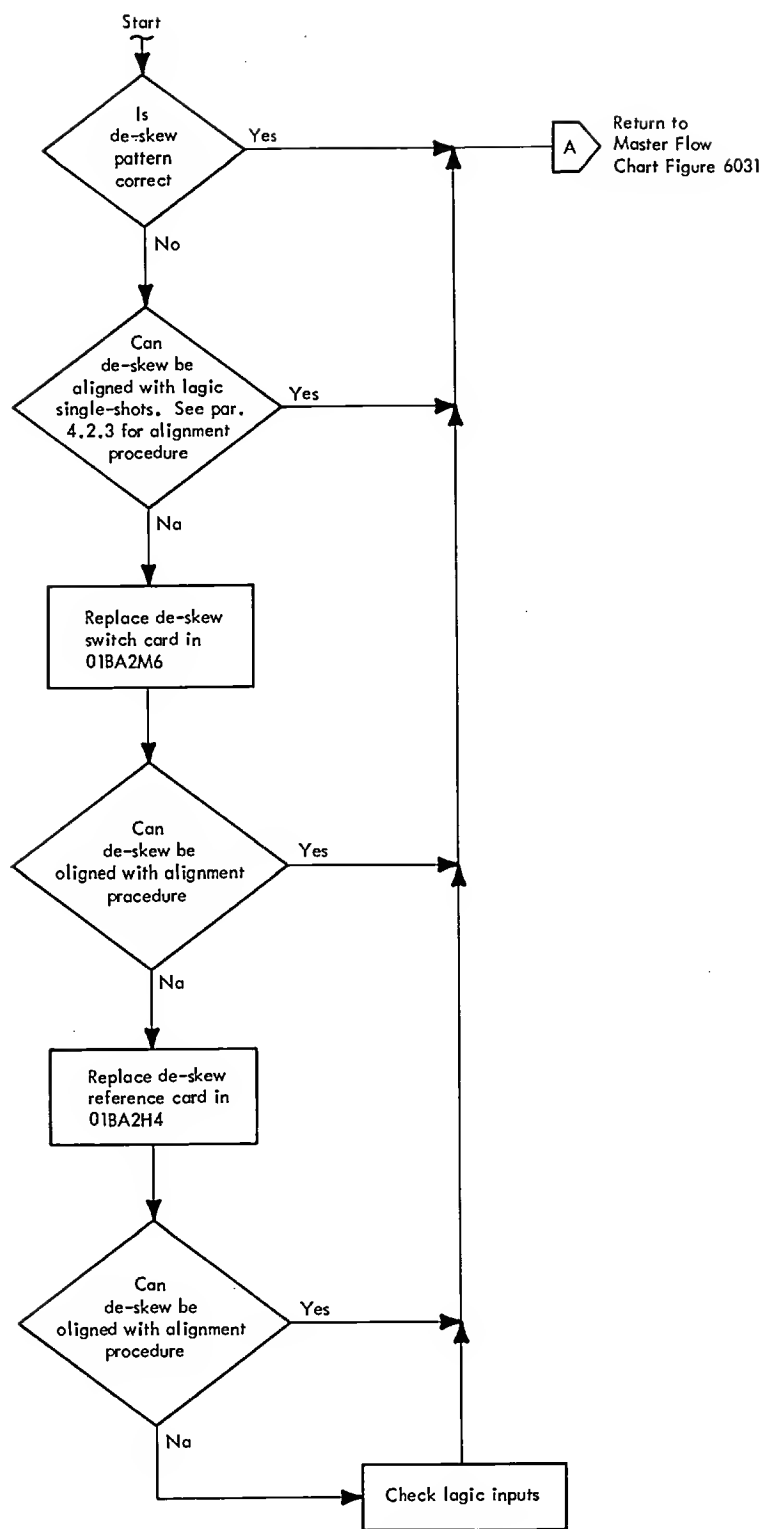


Figure 6038. De-Skew Test Flow Chart

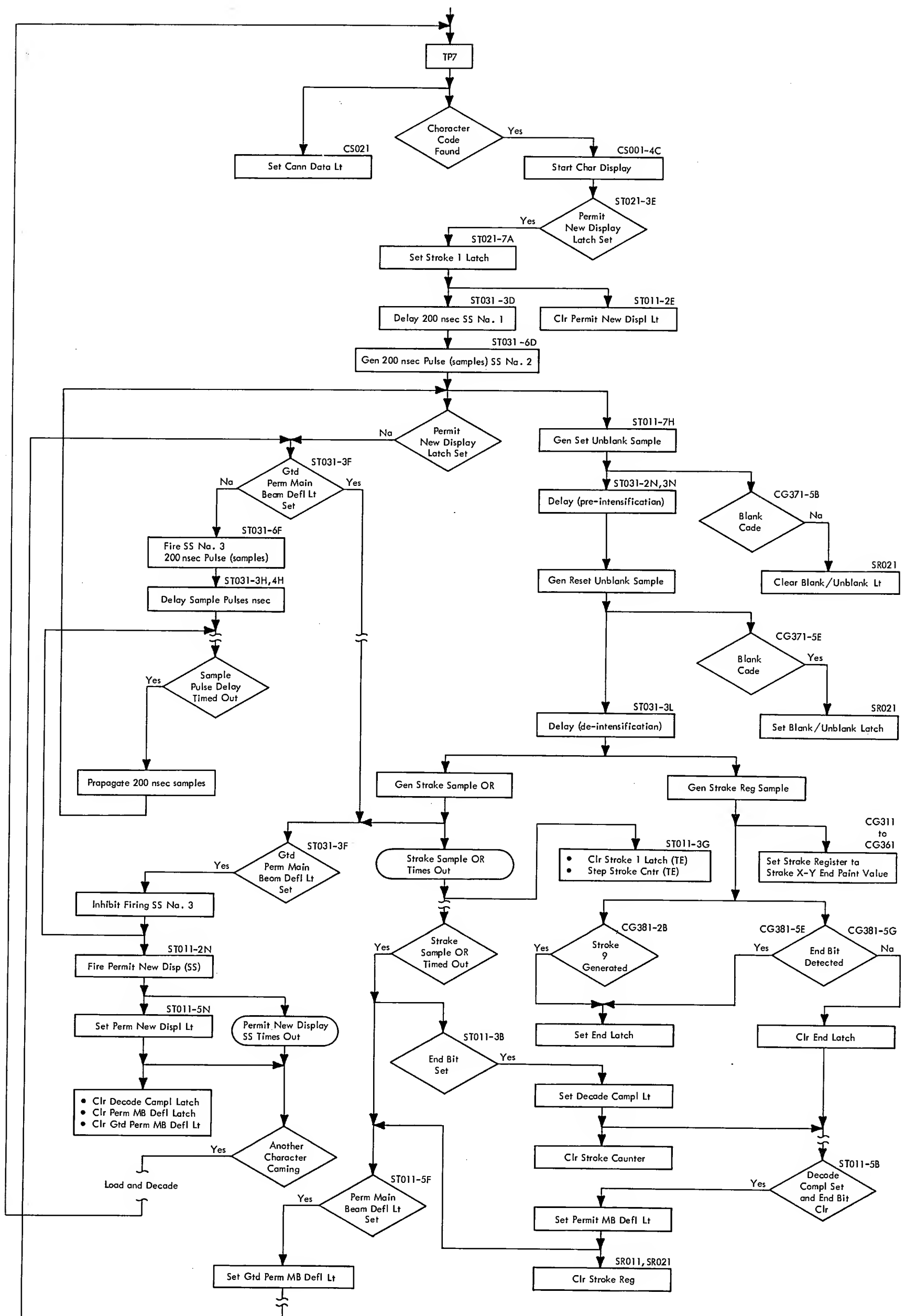


Figure 6039. Character Stroke Control, Flow Chart

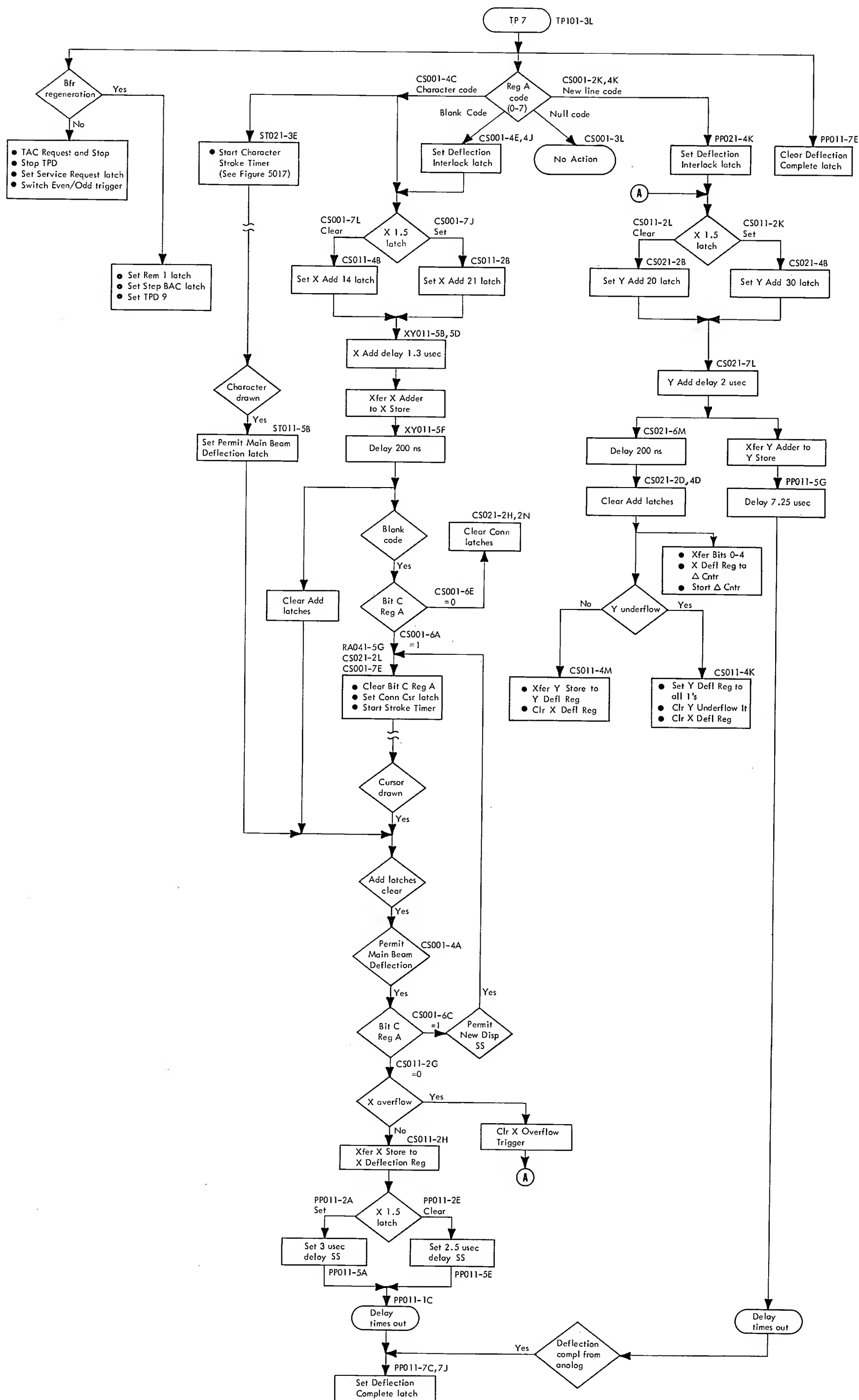


Figure 6040. Character Sequencer, Flow Chart

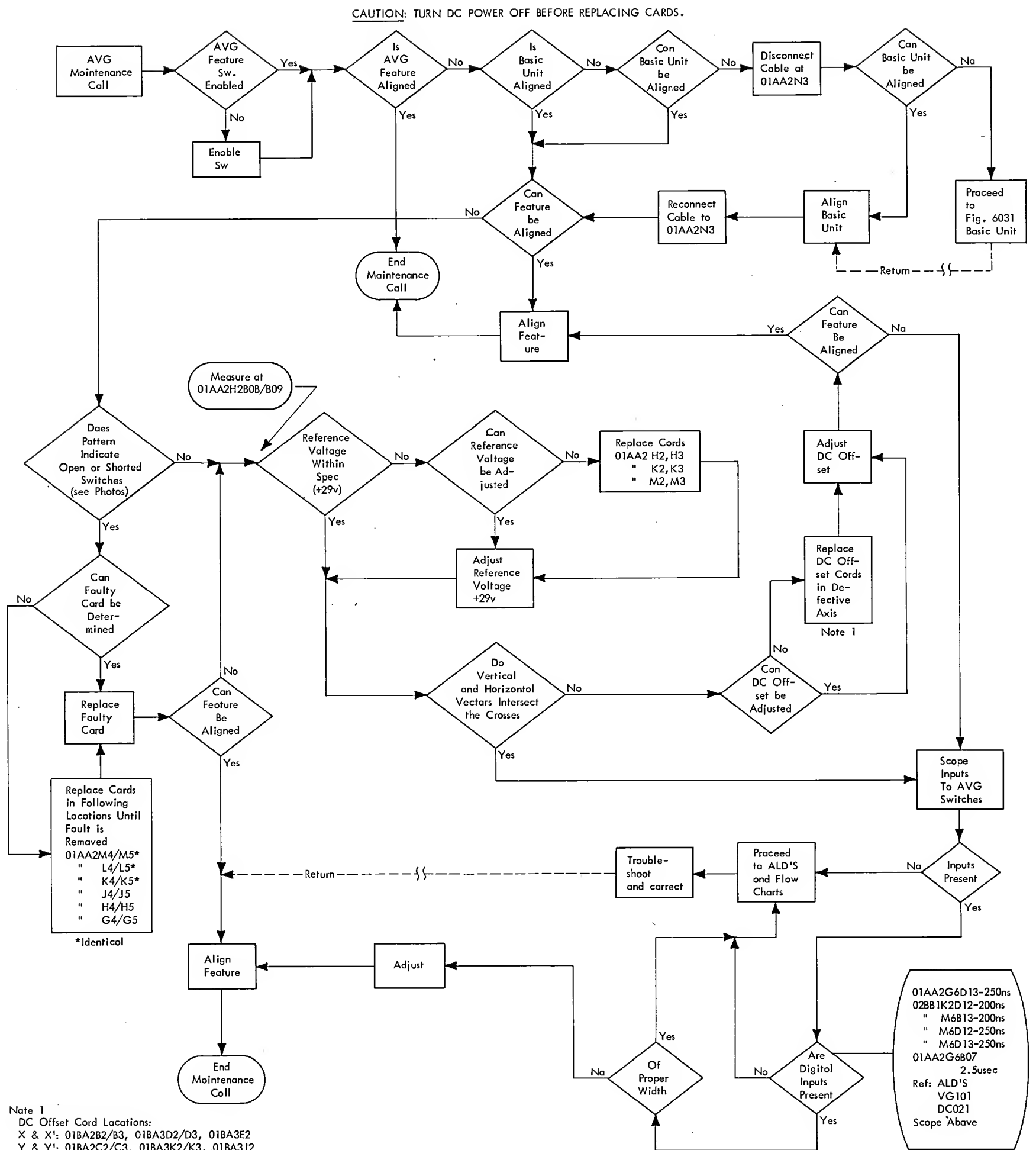


Figure 6041. Absolute Vector Graphics Diagnostic Test Flow Chart

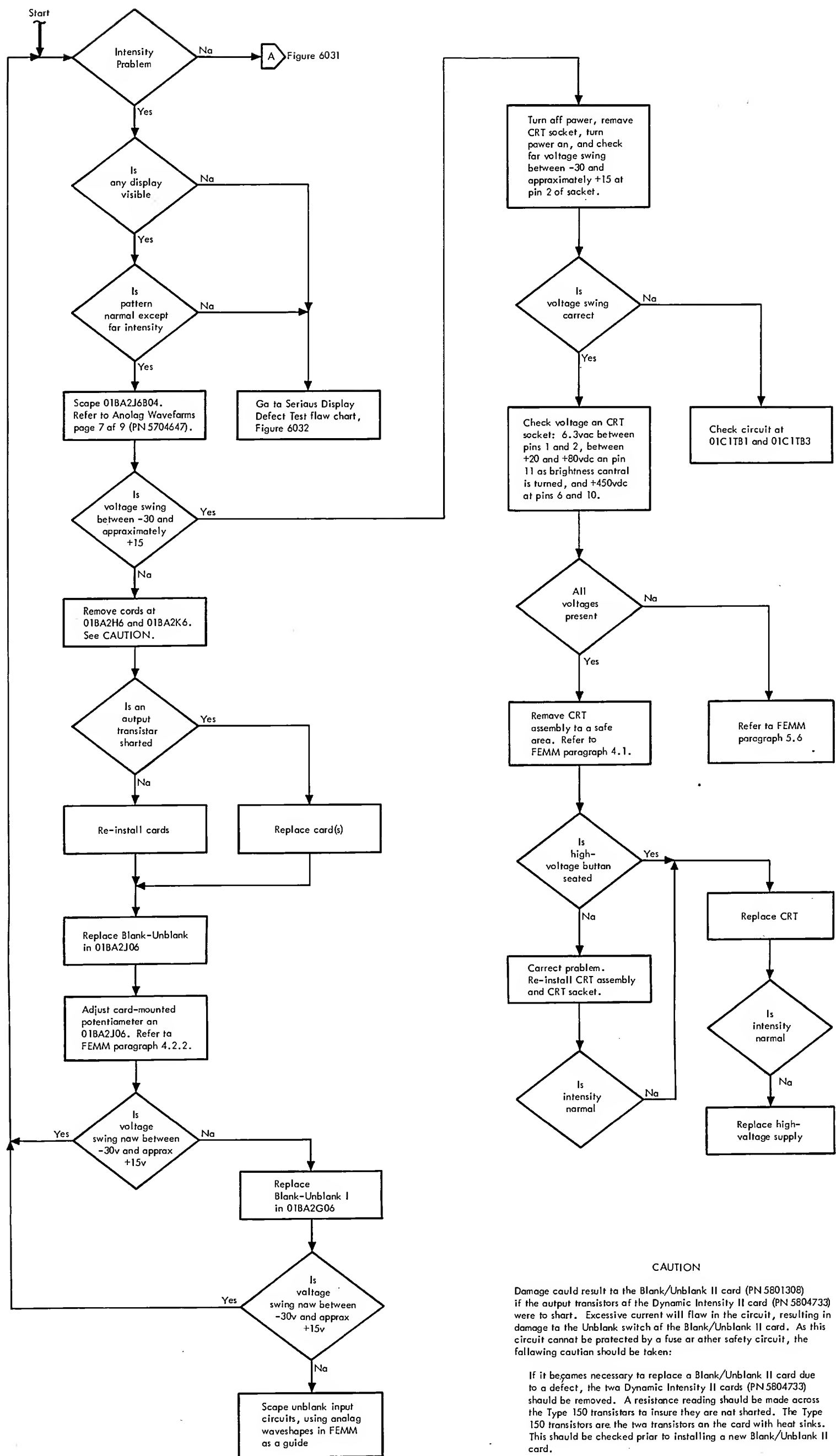


Figure 6042. Intensity Test Flow Chart

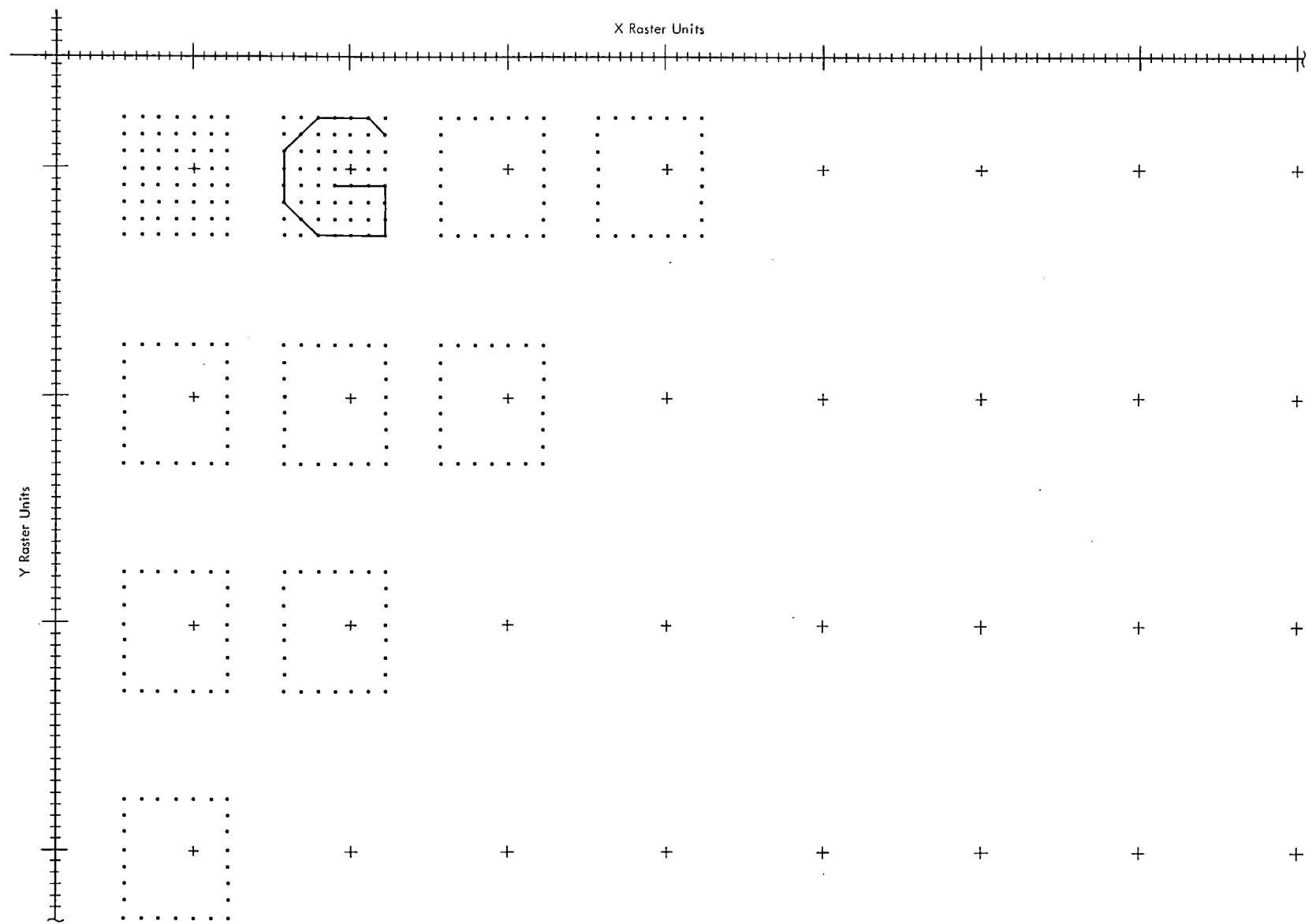


Figure 9000. Size A Characters, Display Distribution

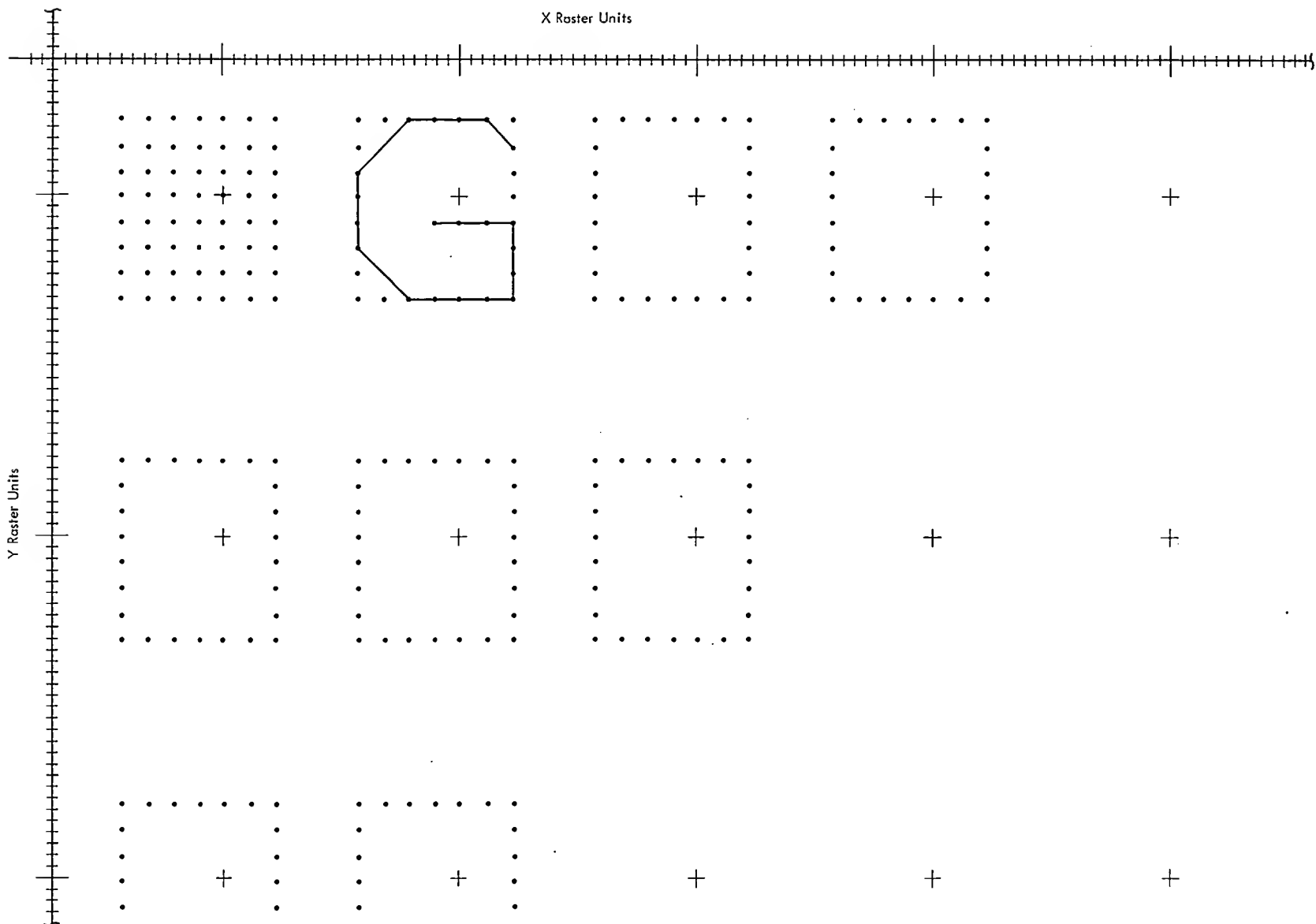


Figure 9001. Size B Characters, Display Distribution

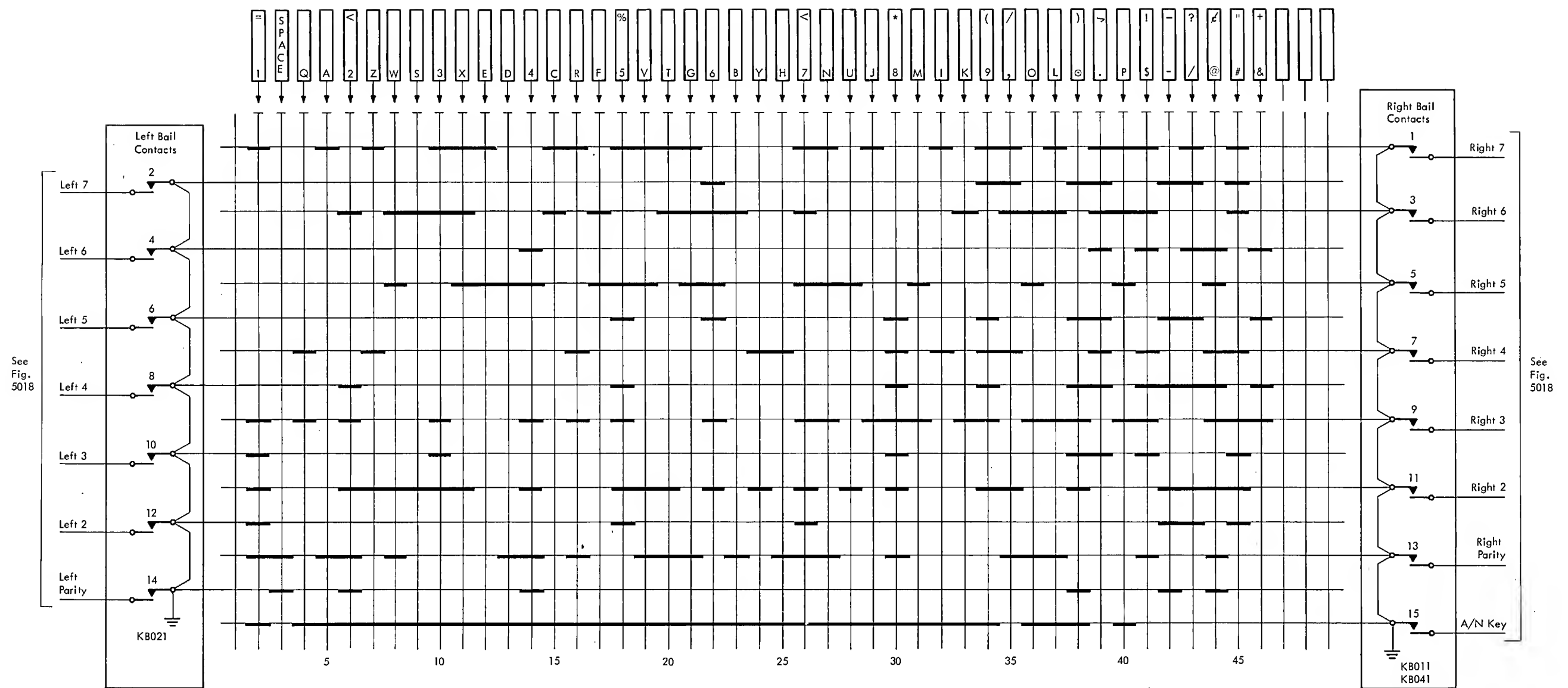


Figure 9002. A/N Keyboard, Encoding Chart

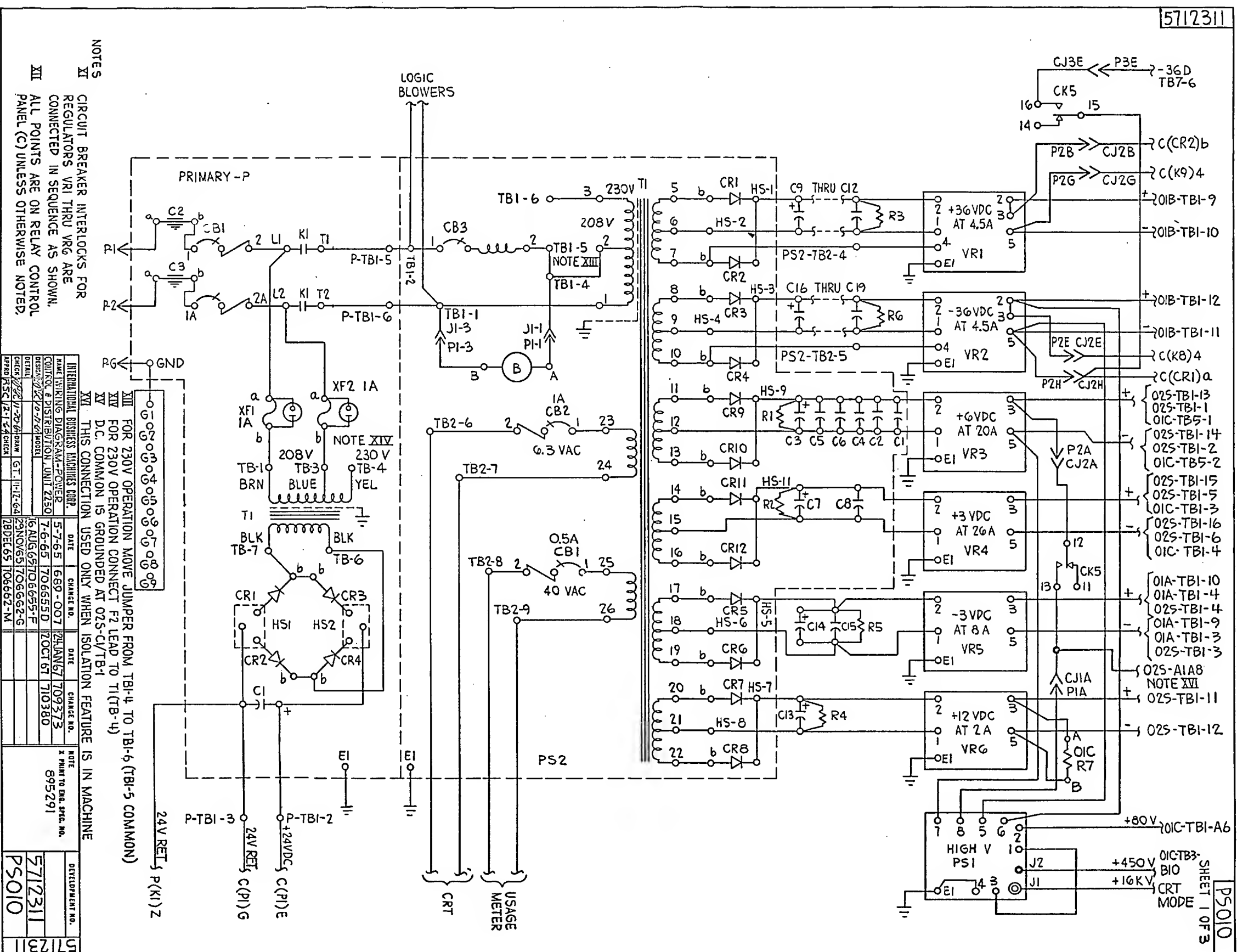
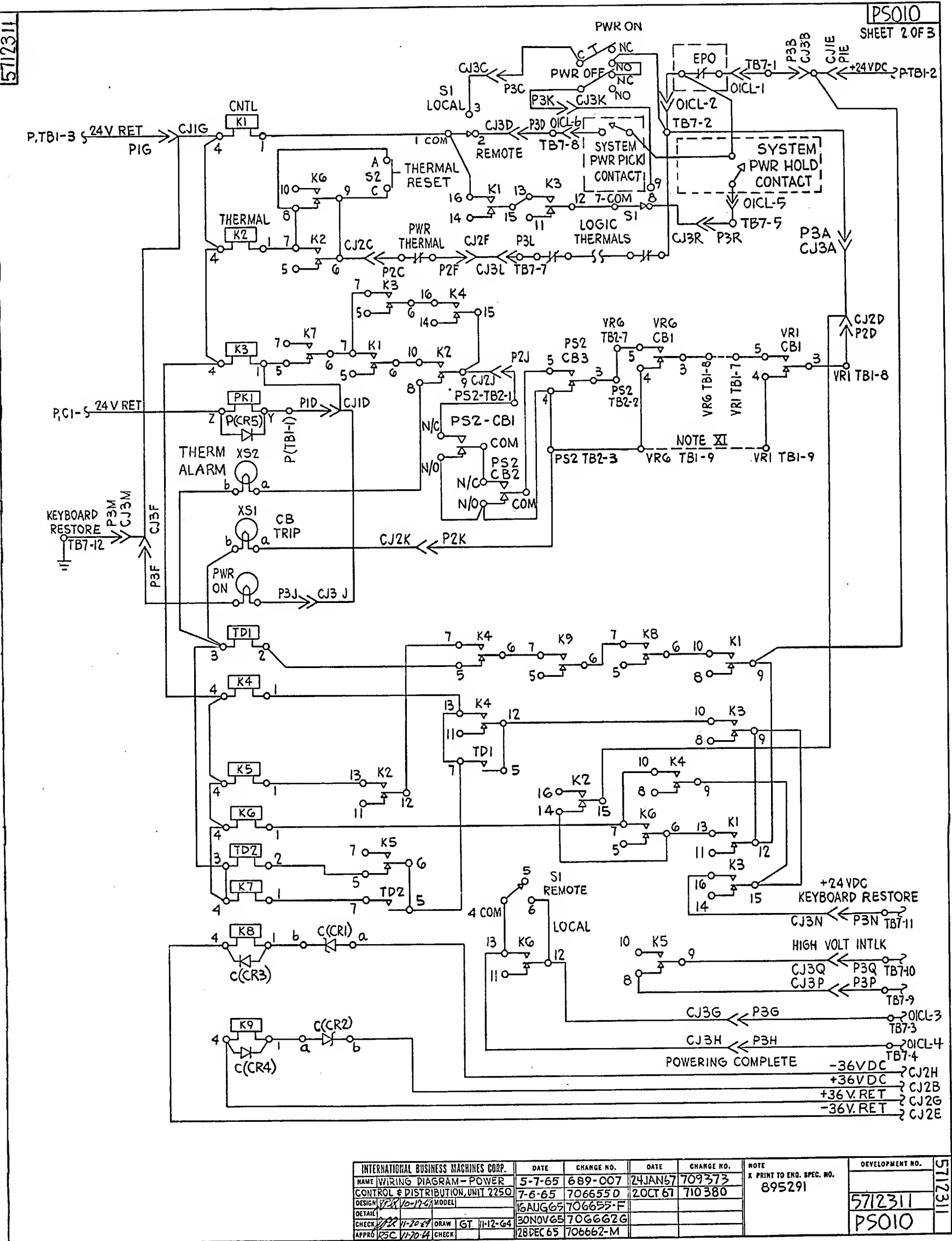
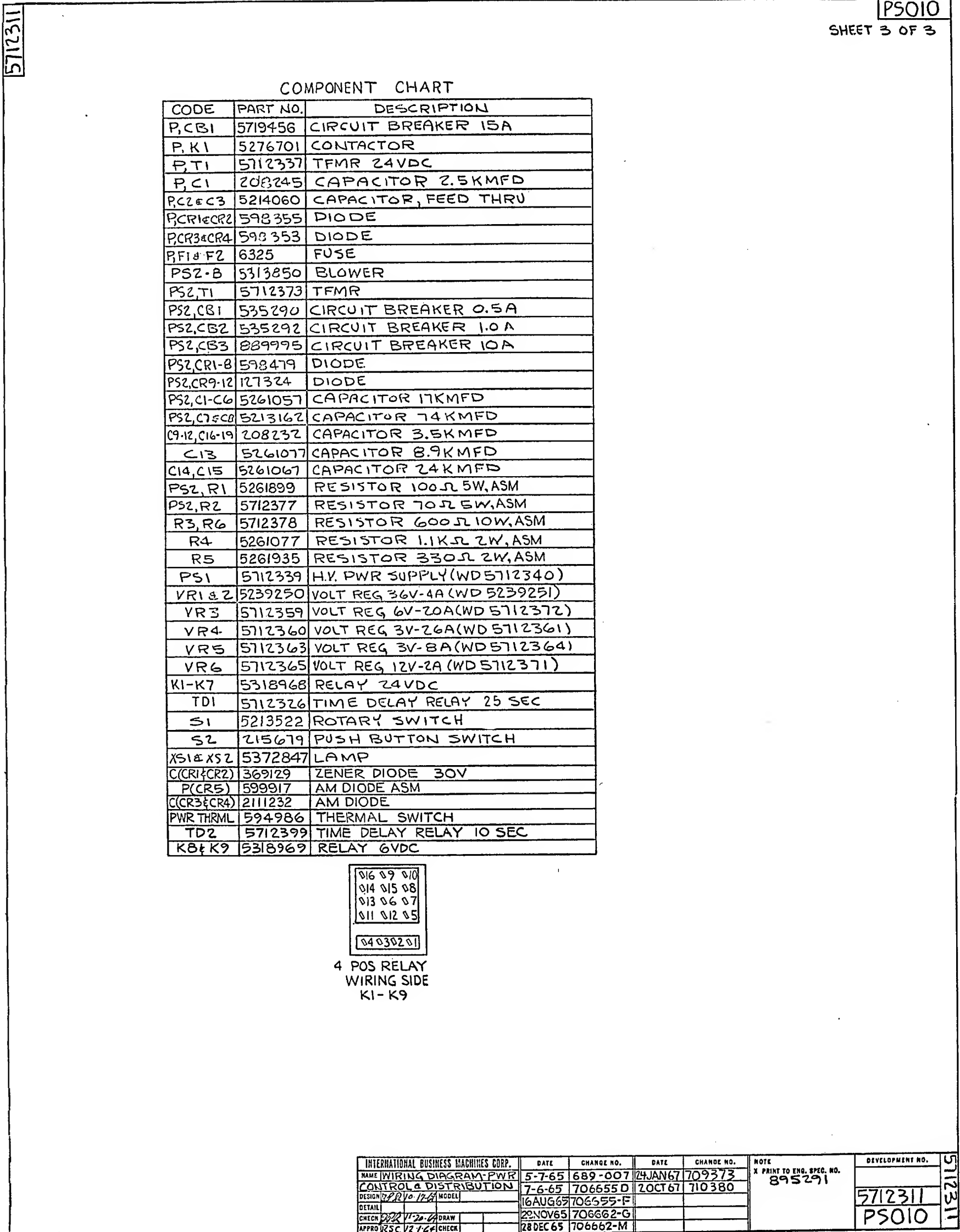
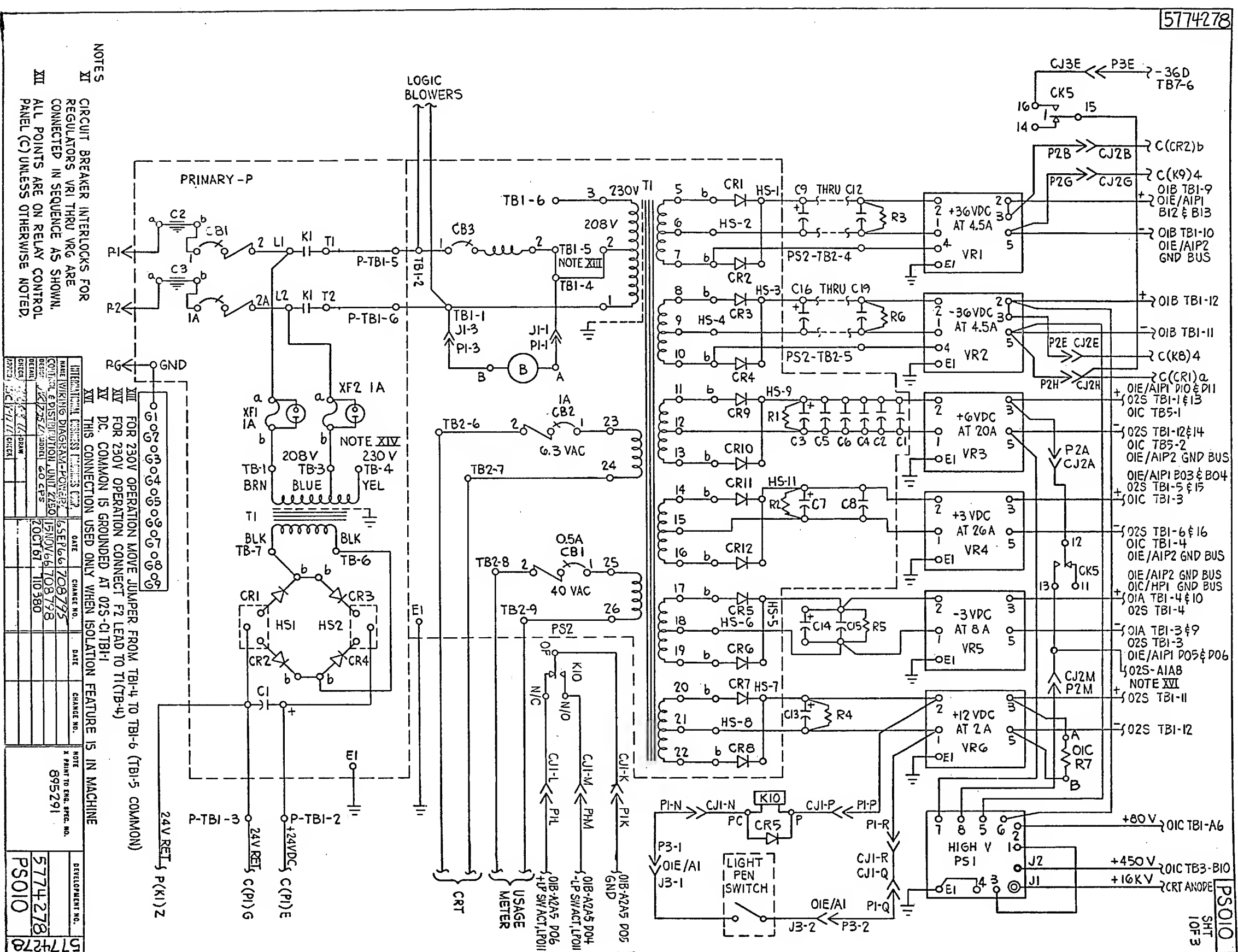


Figure 9003. Power Control and Distribution Wiring Diagram (Sheet 1 of 3)

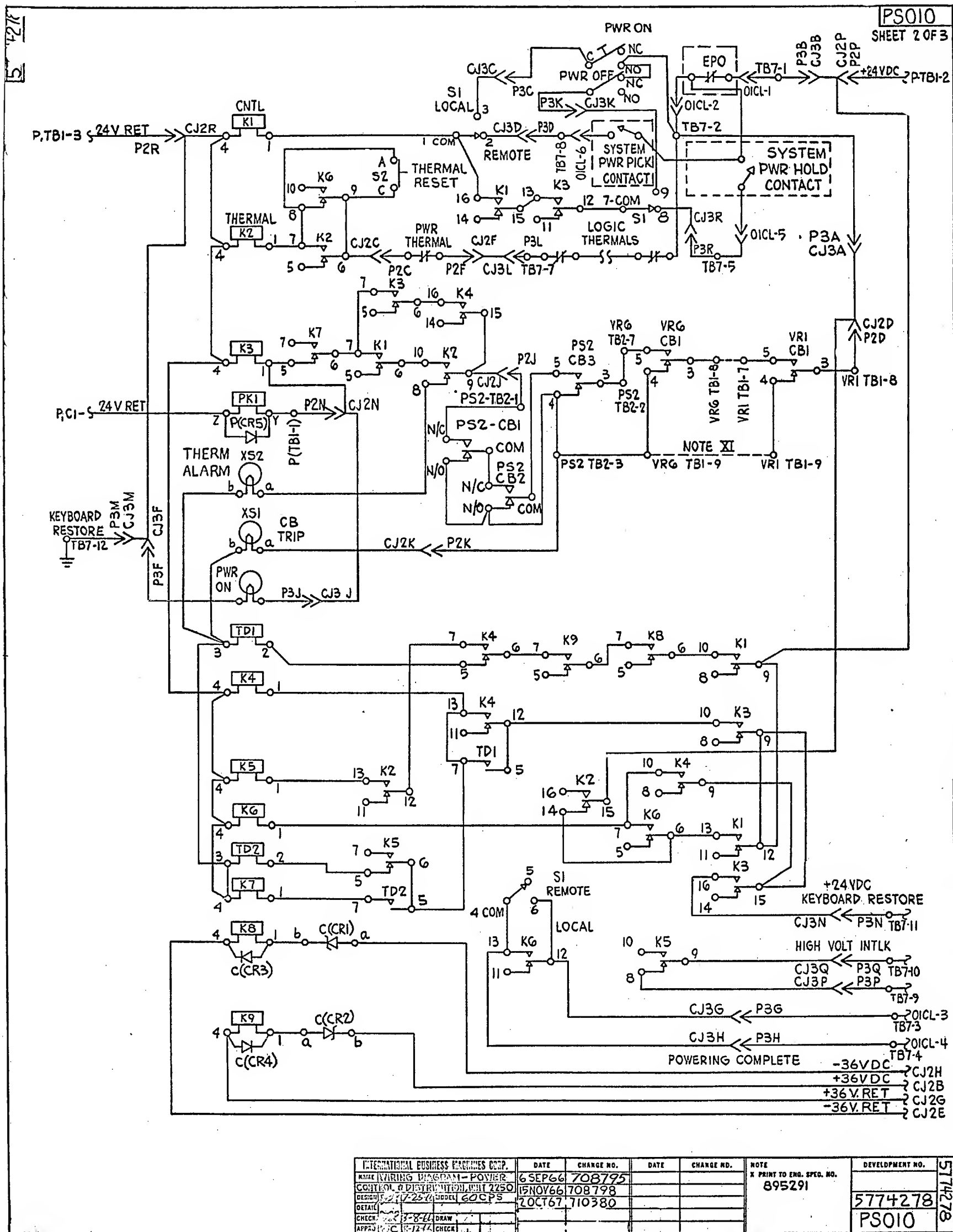


●Figure 9003. Power Control and Distribution Wiring Diagram (Sheet 2 of 3)

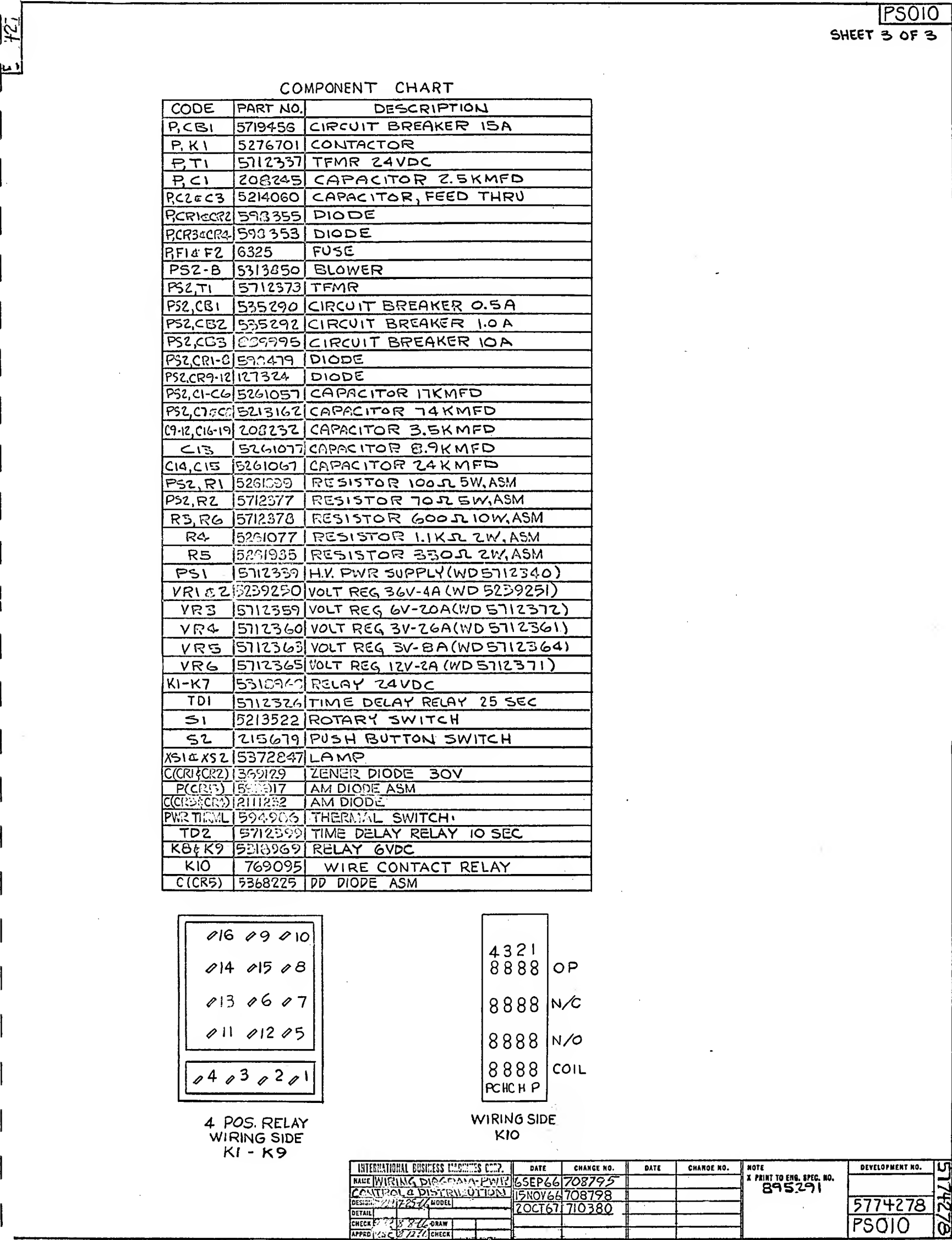




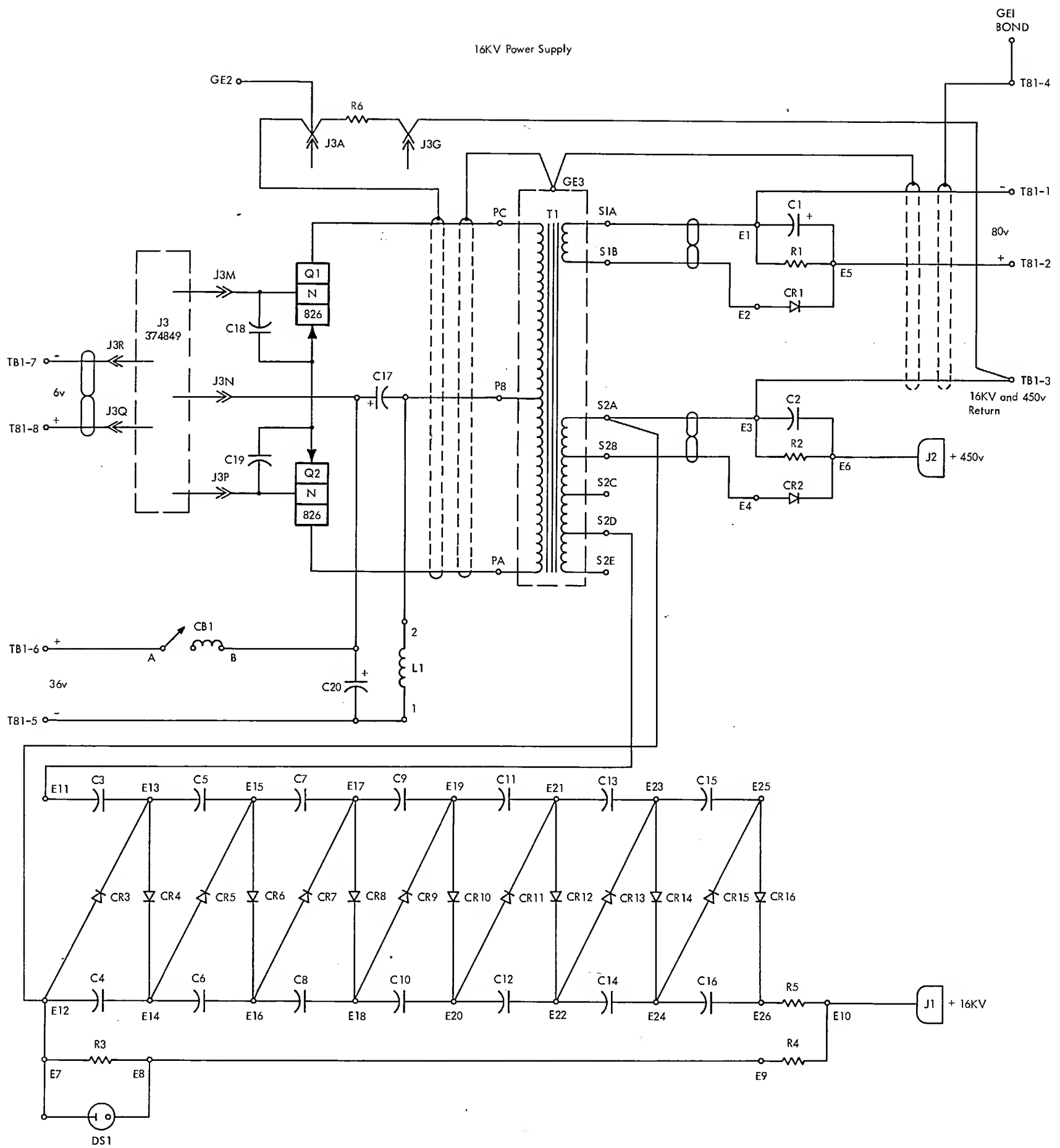
●Figure 9003GDF. Power Control and Distribution Wiring Diagram (for GDF Machines) (Sheet 1 of 3)



●Figure 9003GDF. Power Control and Distribution Wiring Diagram (for GDF Machines) (Sheet 2 of 3)



●Figure 9003GDF. Power Control and Distribution Wiring Diagram (for GDF Machines)(Sheet 3 of 3)



Component Chart		
Ref Des	Part Number	Description
C1	482148	Capacitor 5mf
C2	5213609	0.05mf
C3-C16	5213619	0.01mf
C17	369849	50mf
C18, C19	5213577	1mf
C20	526332	Capacitor 450mf
CB1	526663	Circuit Breaker
CR1	341622	Diode
CR2-CR16	5213417	Rectifier Silicon
R1	323989	Resistor 47K 1W
R2	132699	8.2 meg 1/2W
R3	5213463	3.3 meg 2W
R4	5213583	100 meg 5W
R5	317047	220K 1W
R6	317026	Resistor 9.1K 1/2W
J3	374849	Card, Oscillator
T1	5712353	Transformer
Q1, Q2	5261889	Transistor 826
L1	5712376	Inductor
DS1	194587	Neon Lamp

Figure 9004. High Voltage Power Supply Wiring Diagram

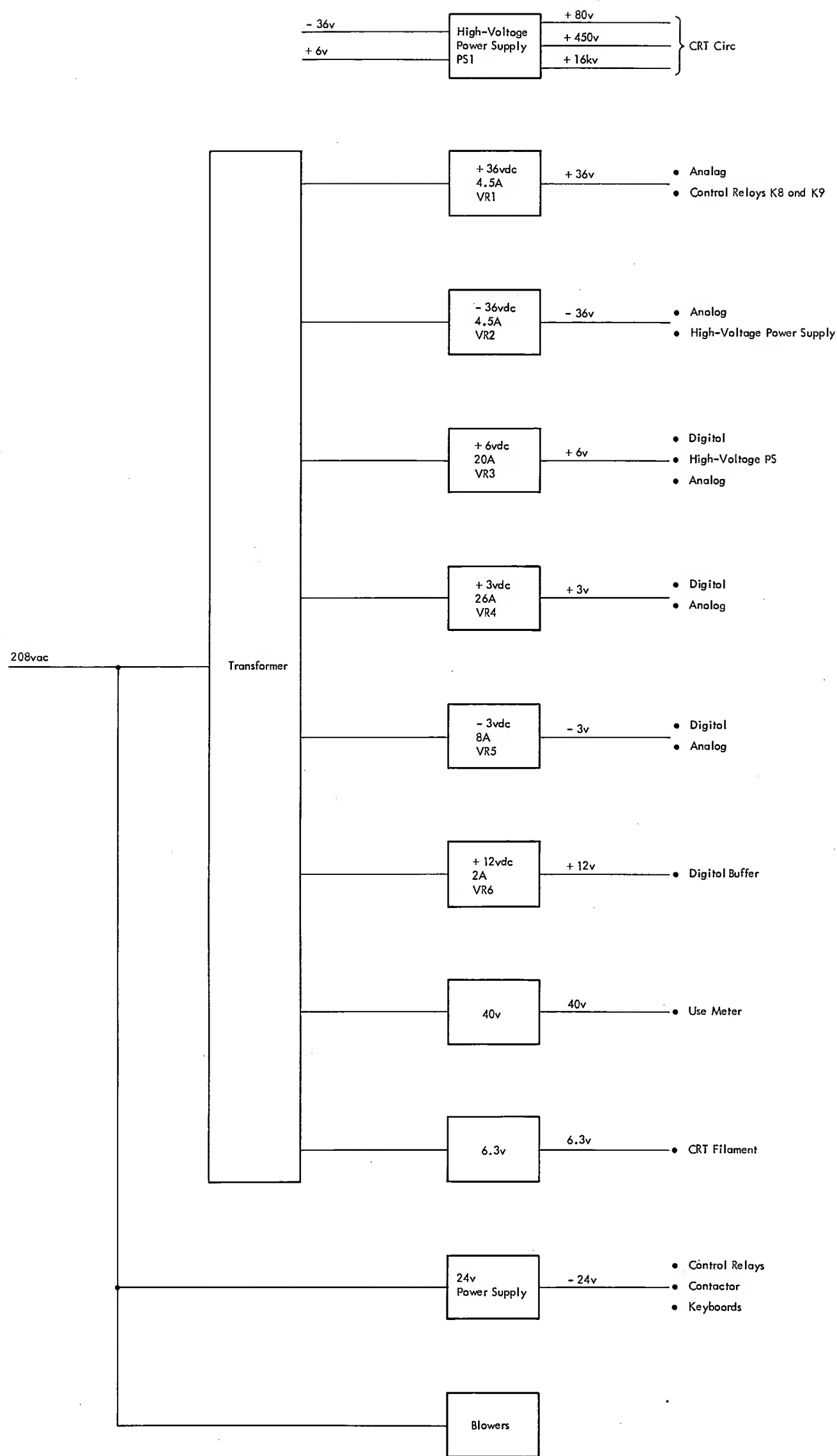
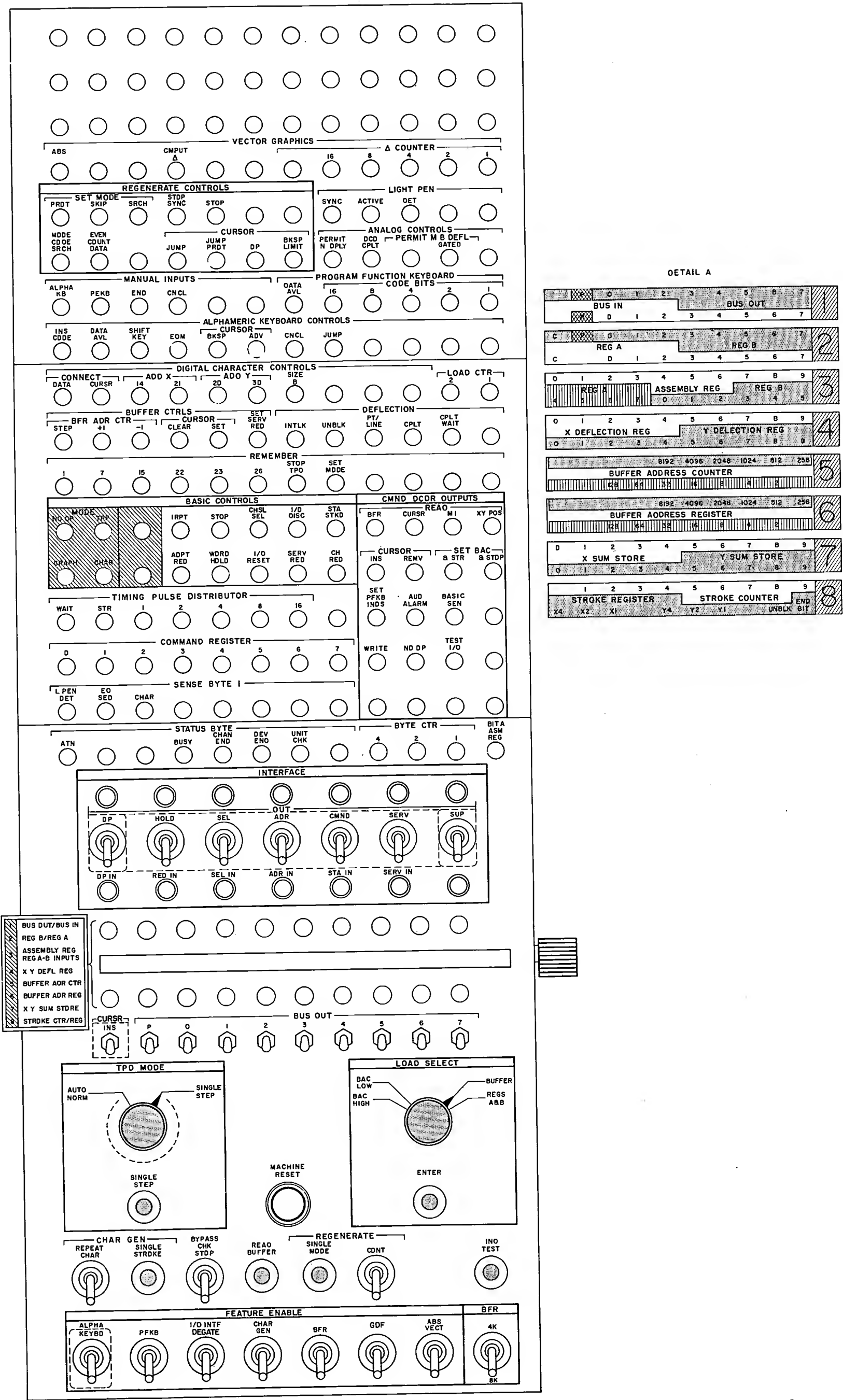


Figure 9005. Power Distribution



●Figure 9006. 2250 CE Panel



Figure 9007. Character Stroke, Timing Chart

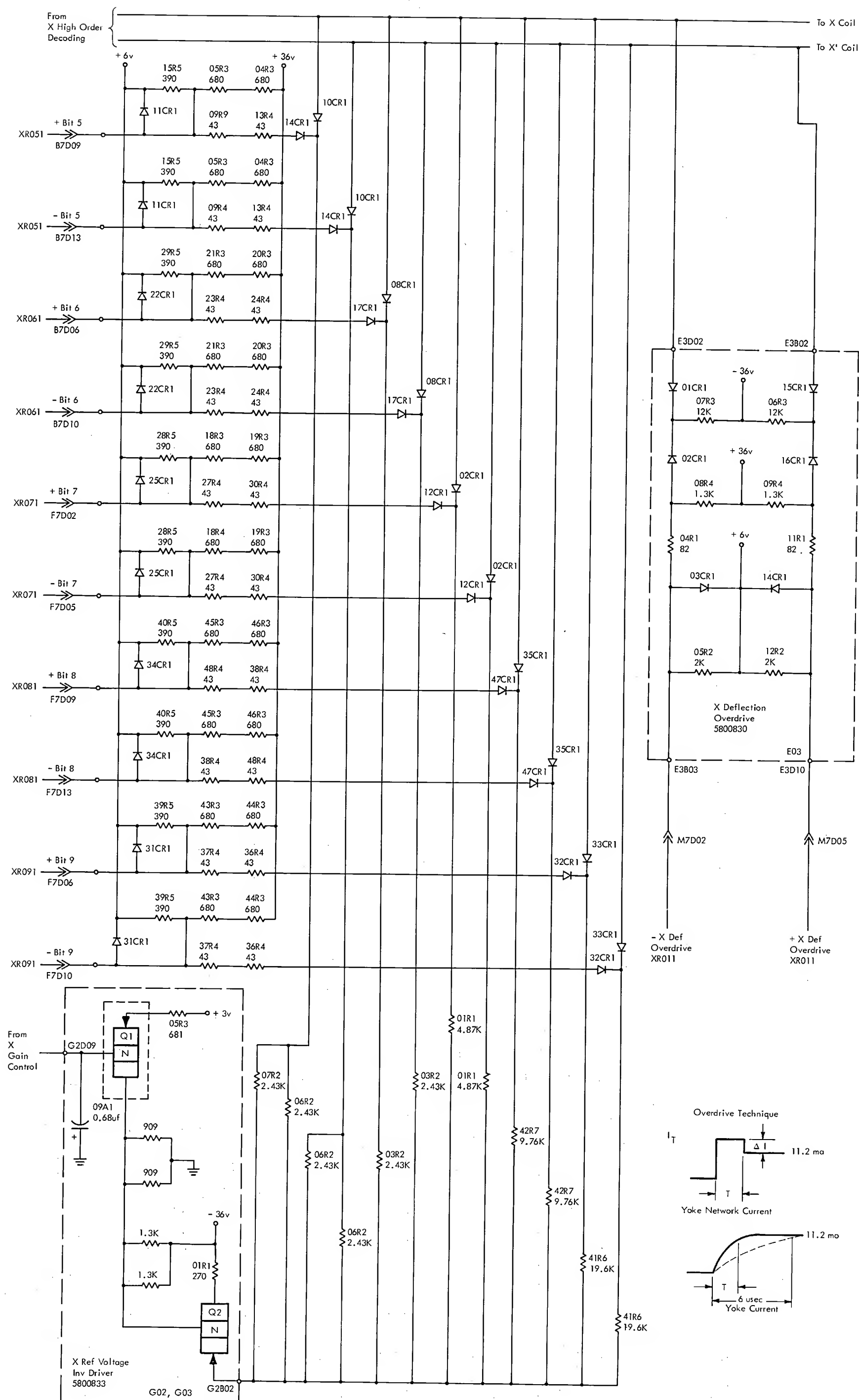


Figure 9009. Main Deflection, Low-Order Decoding and Control, Wiring Diagram

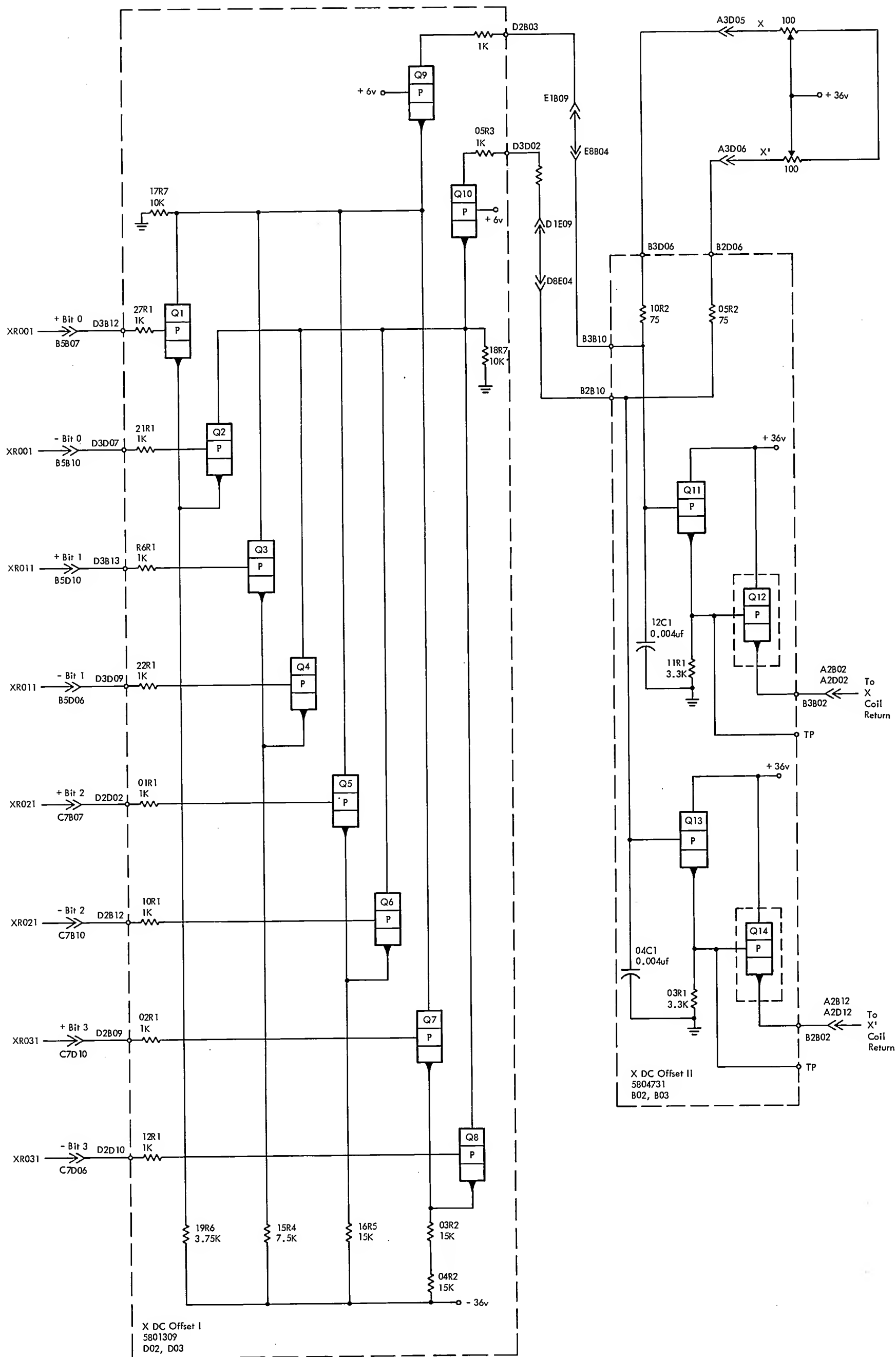


Figure 9010. Main Deflection, DC Offset Control, Wiring Diagram

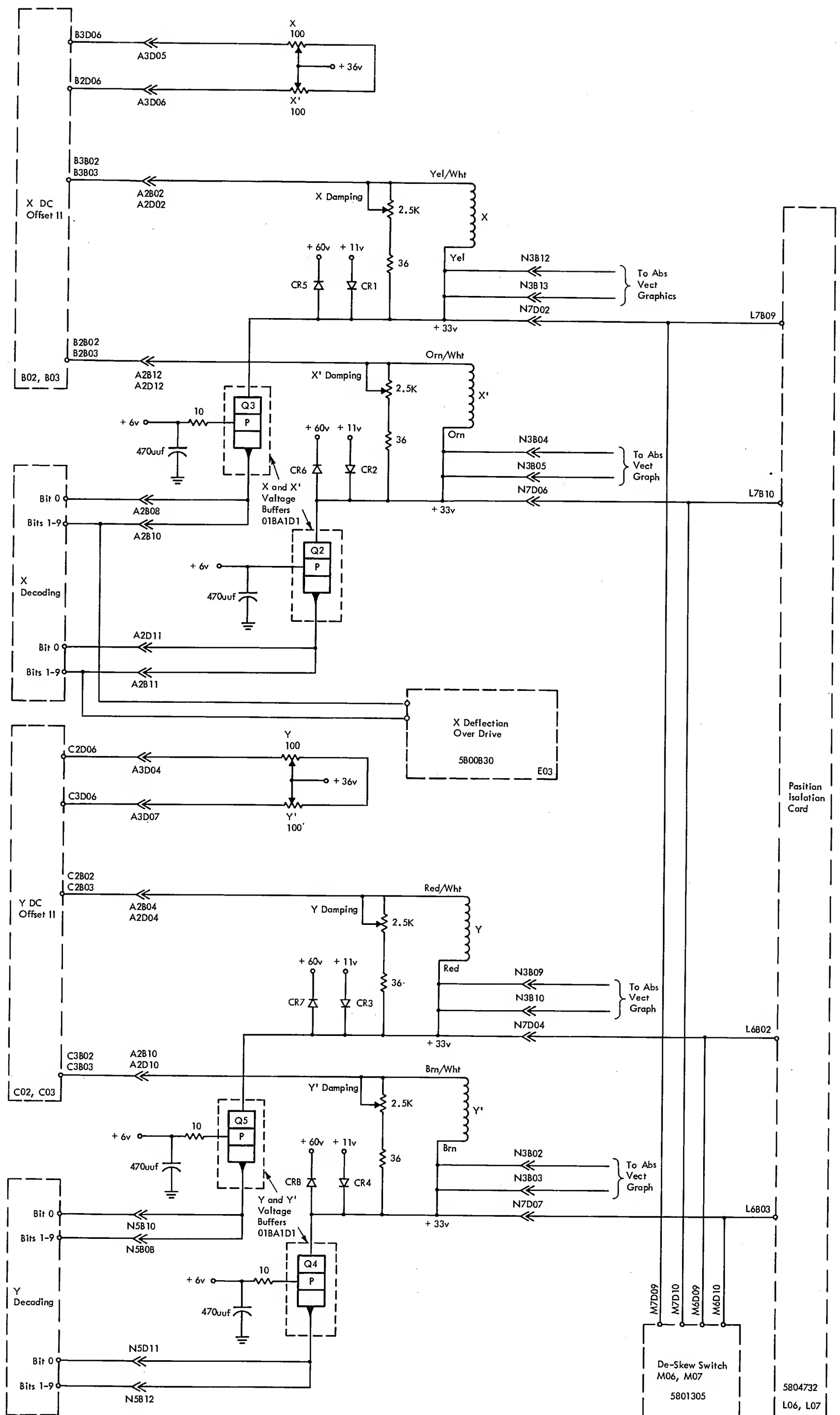


Figure 9011. Main Deflection, Yoke Control Circuits, Wiring Diagram

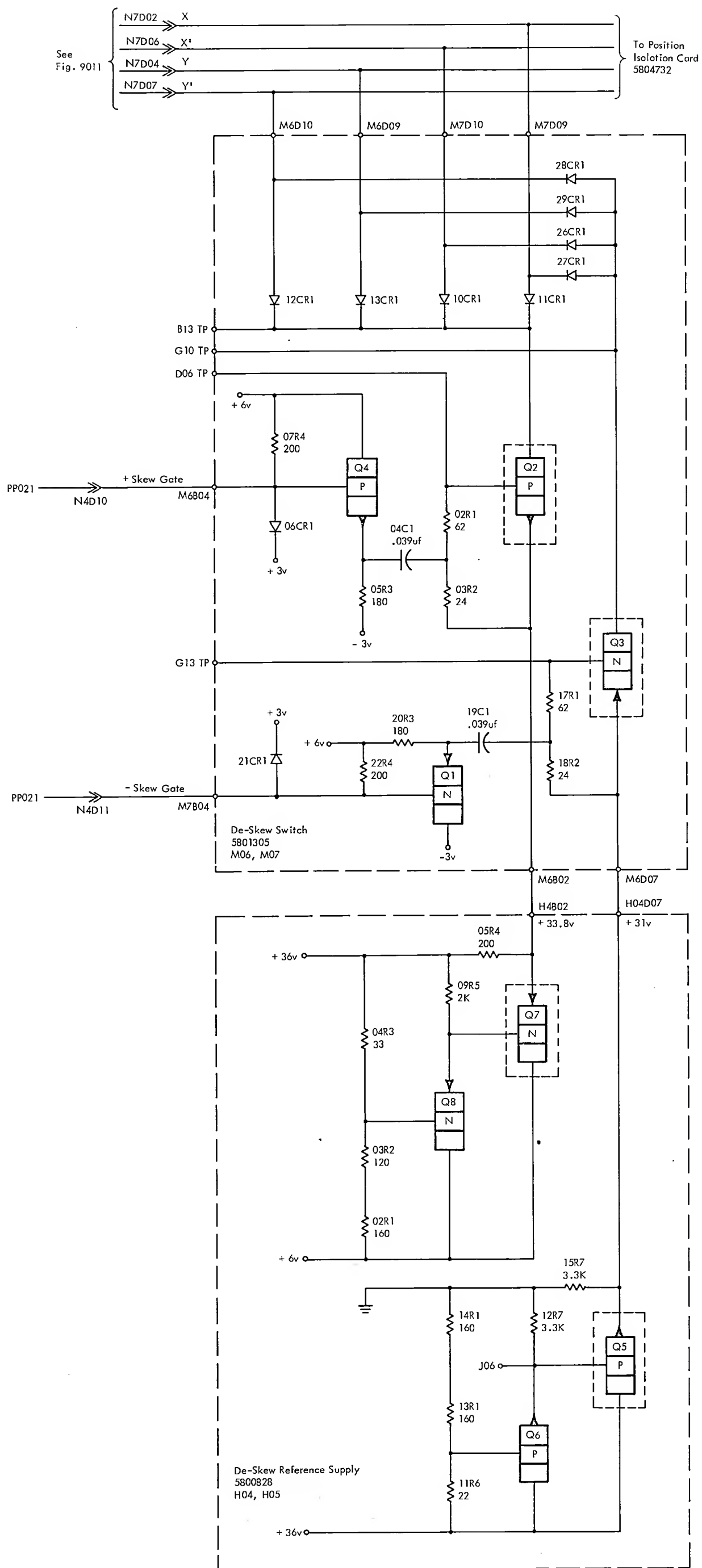


Figure 9012. Main Deflection, De-Skew Control Circuits, Wiring Diagram

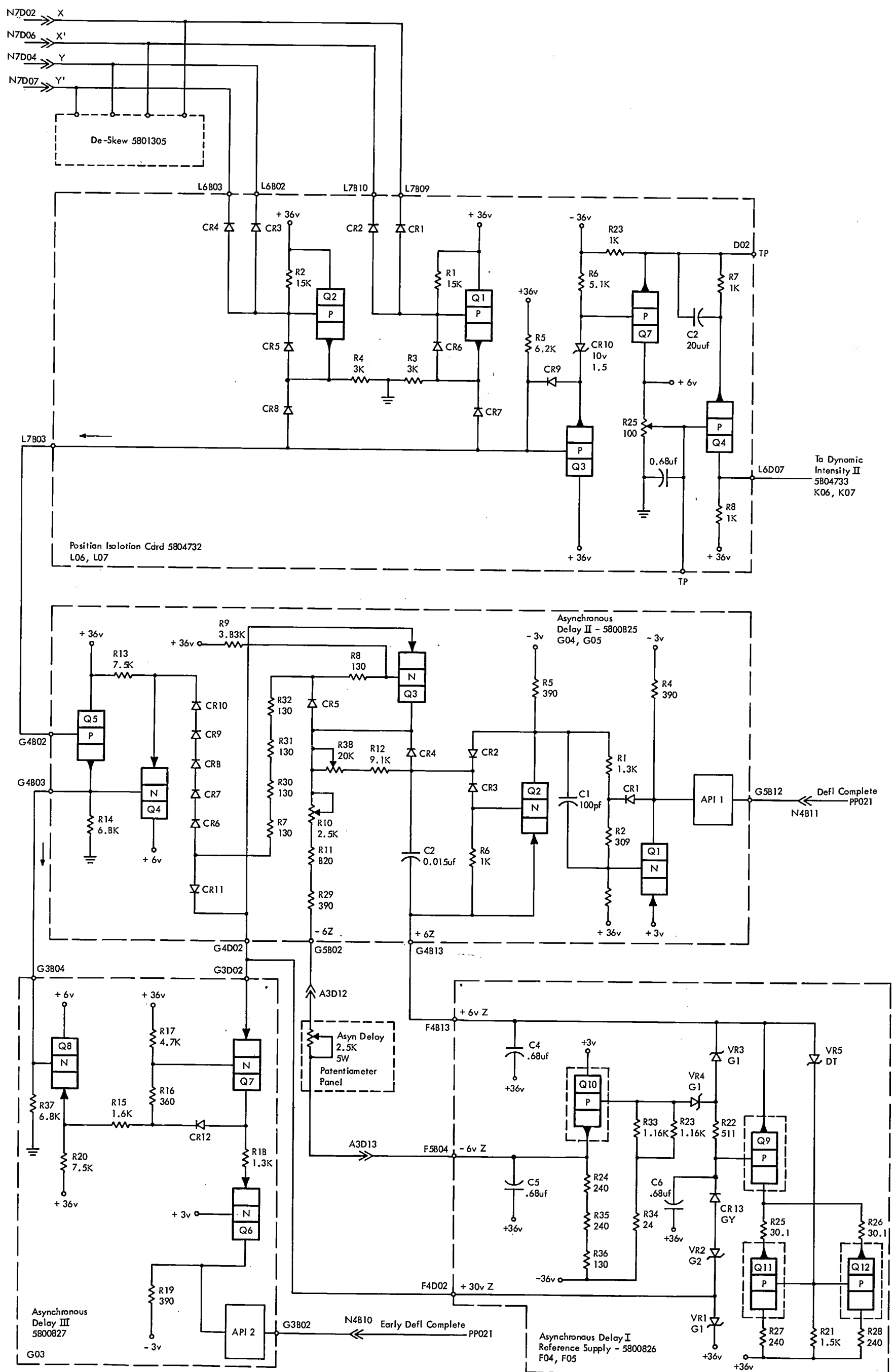


Figure 9013. Main Deflection, Position Isolation and Asynchronous Delay Circuits, Wiring Diagram

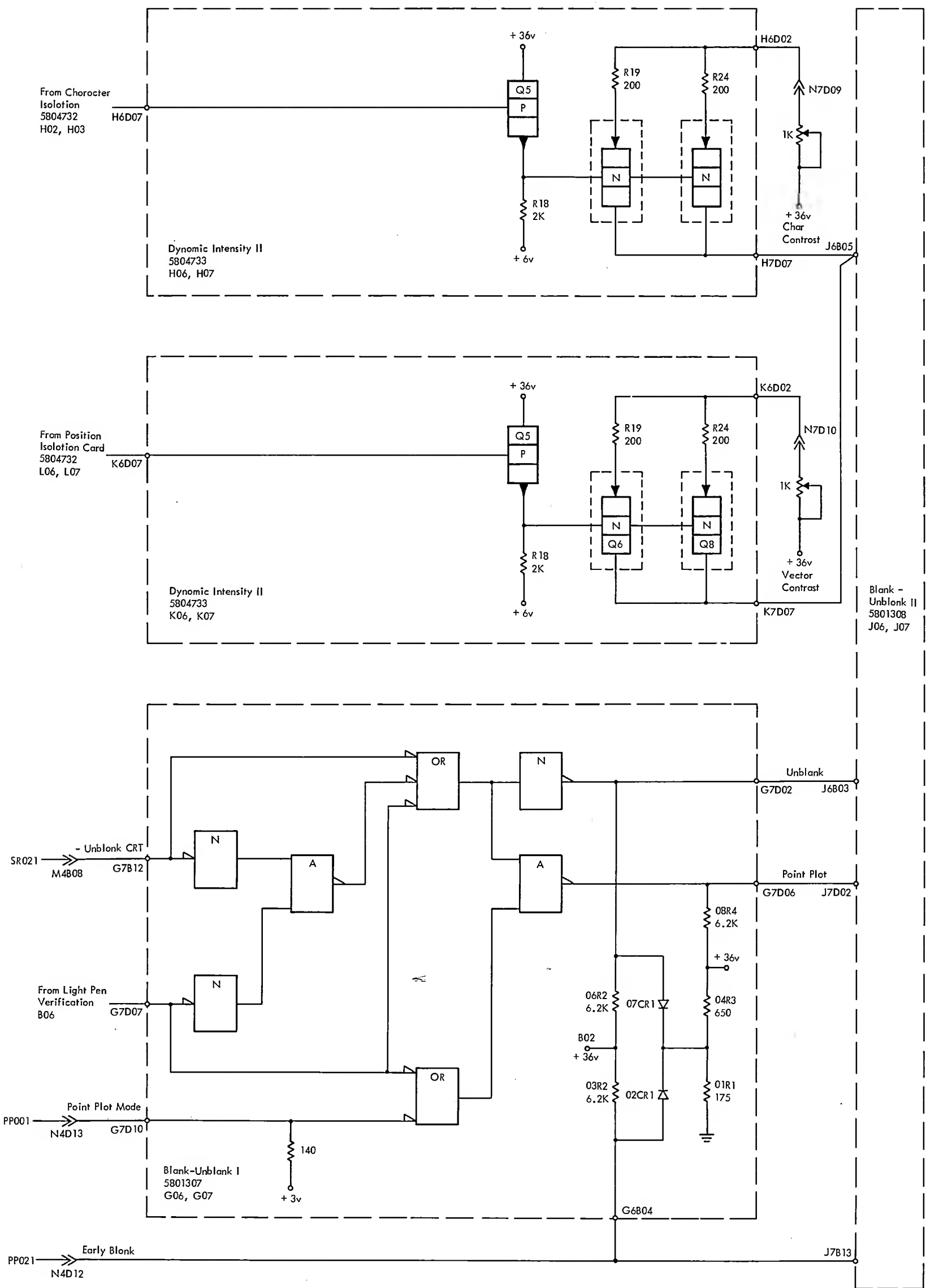


Figure 9014. Dynamic Intensity I and Blank-Unblank I Circuits, Wiring Diagram

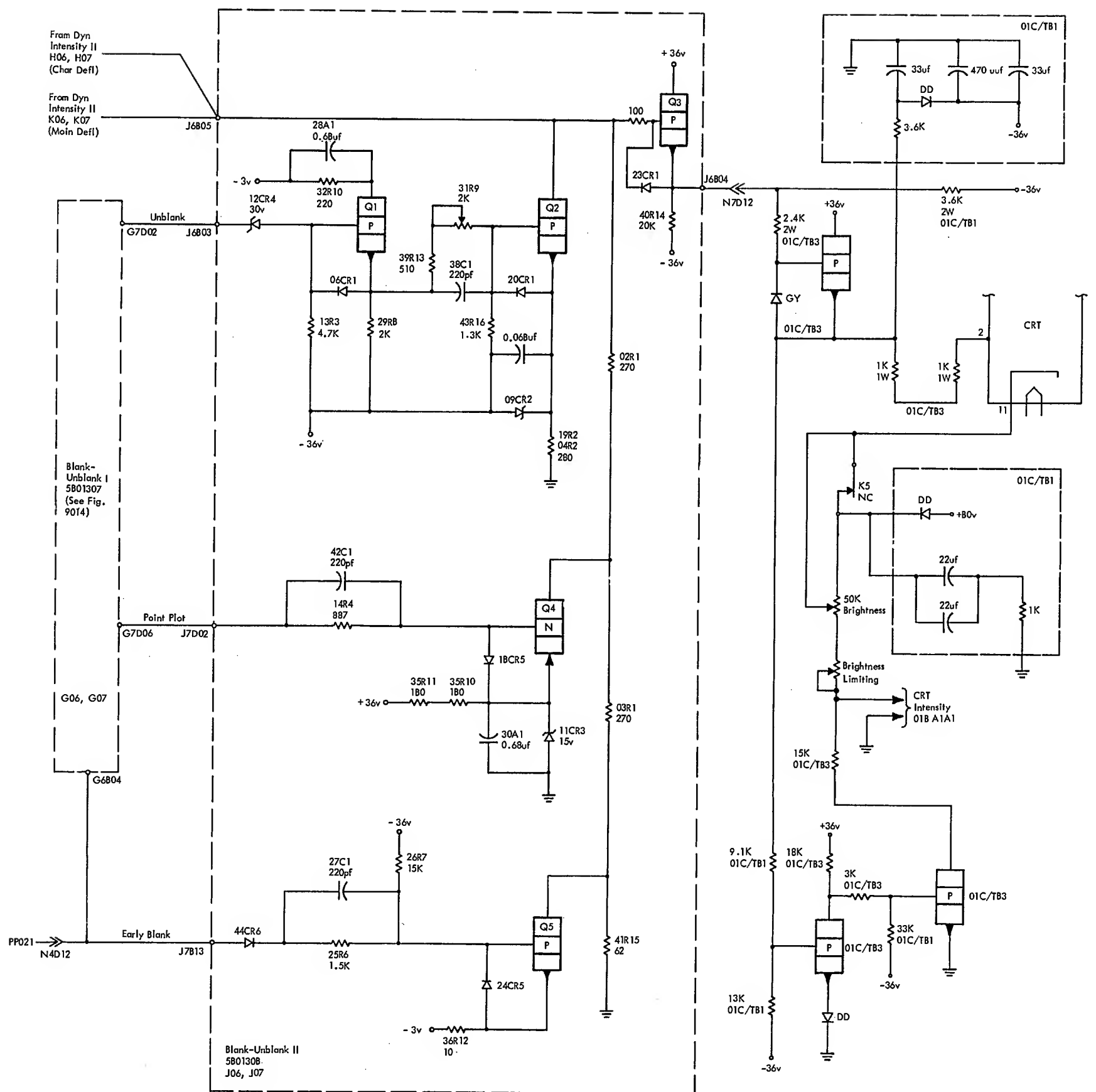


Figure 9015. Dynamic Intensity Blank-Unblank II Circuits, Wiring Diagrams

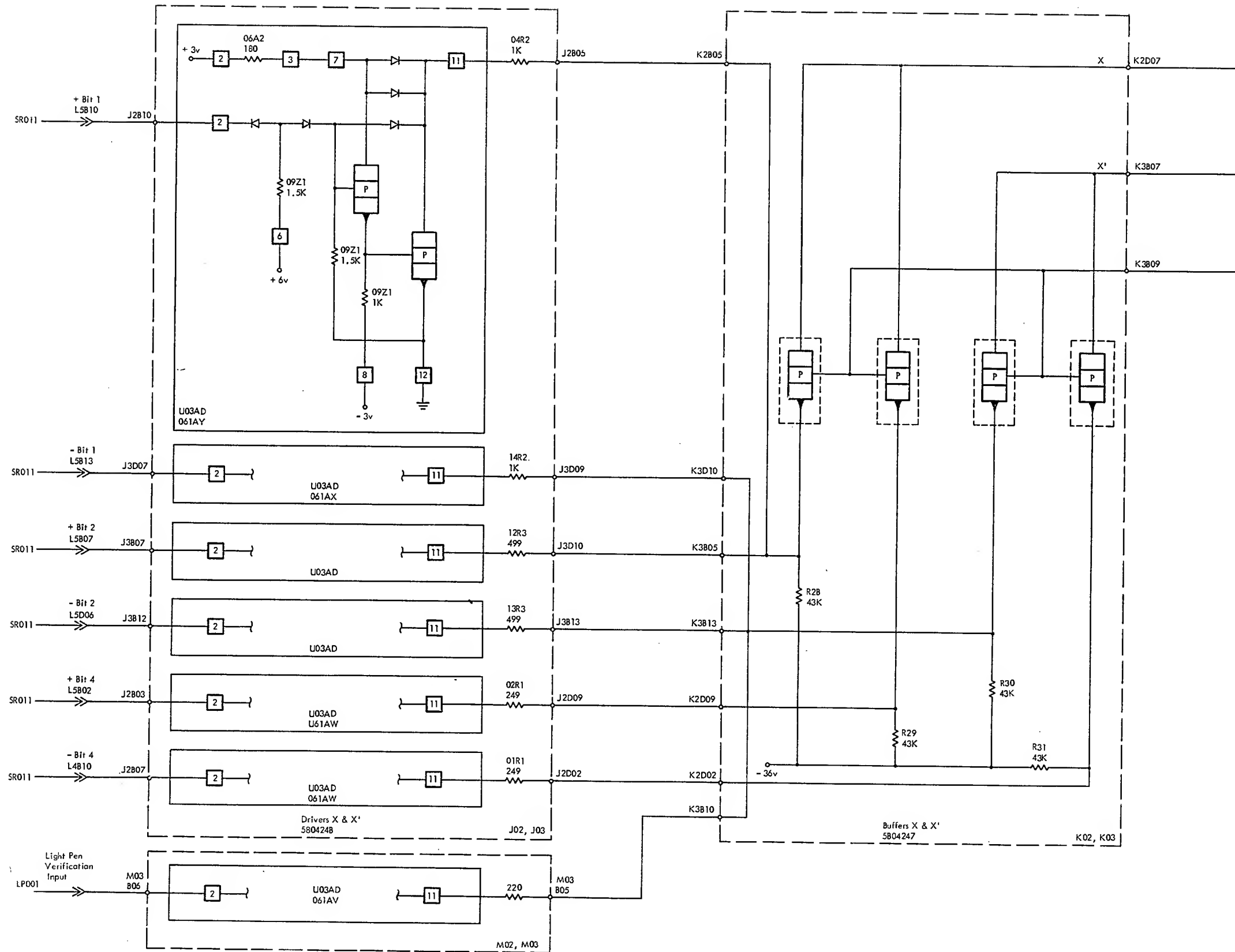


Figure 9016. Character Deflection, Decode Circuits, Wiring Diagrams

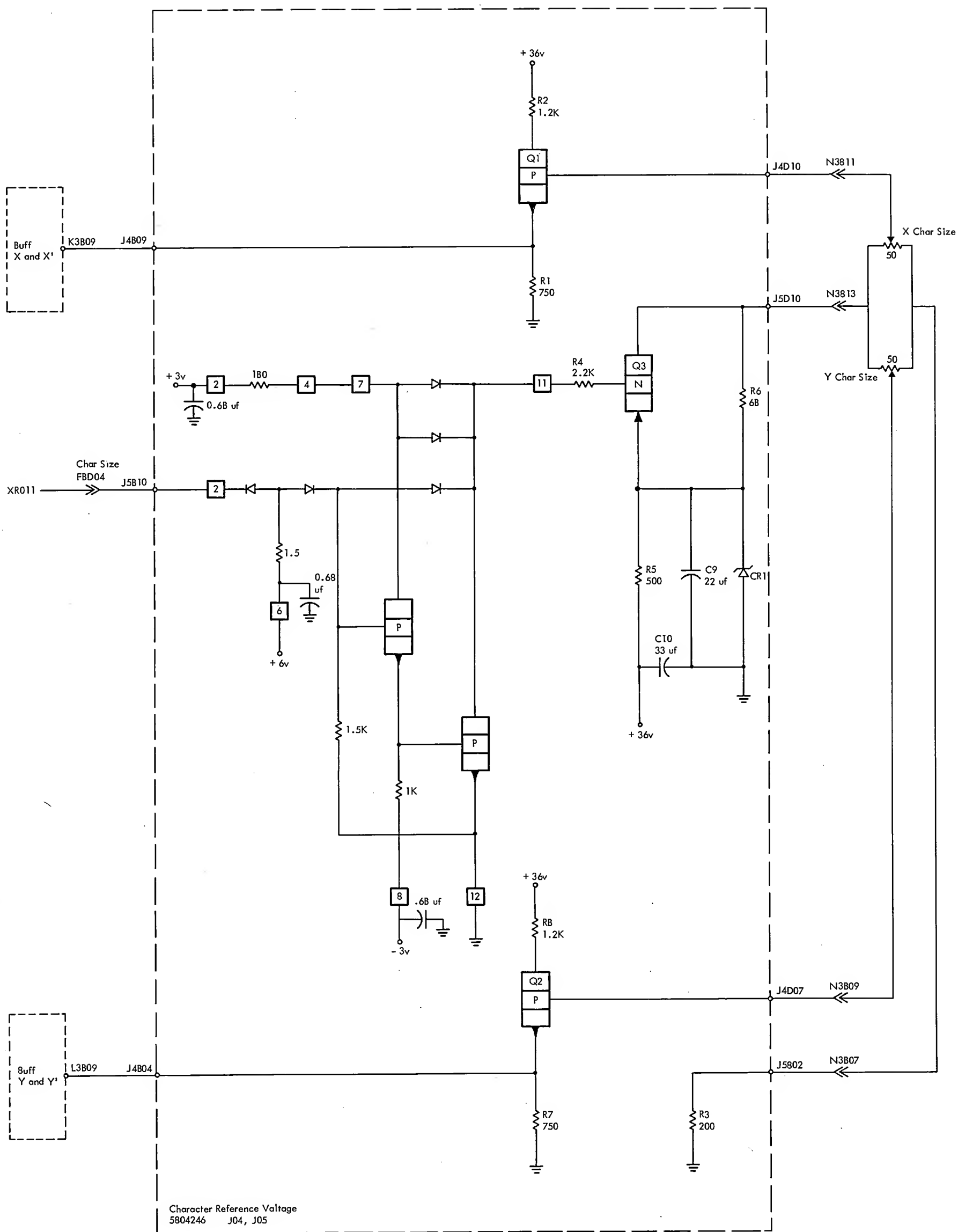


Figure 9017. Character Deflection, Reference Voltage Supply, Wiring Diagram

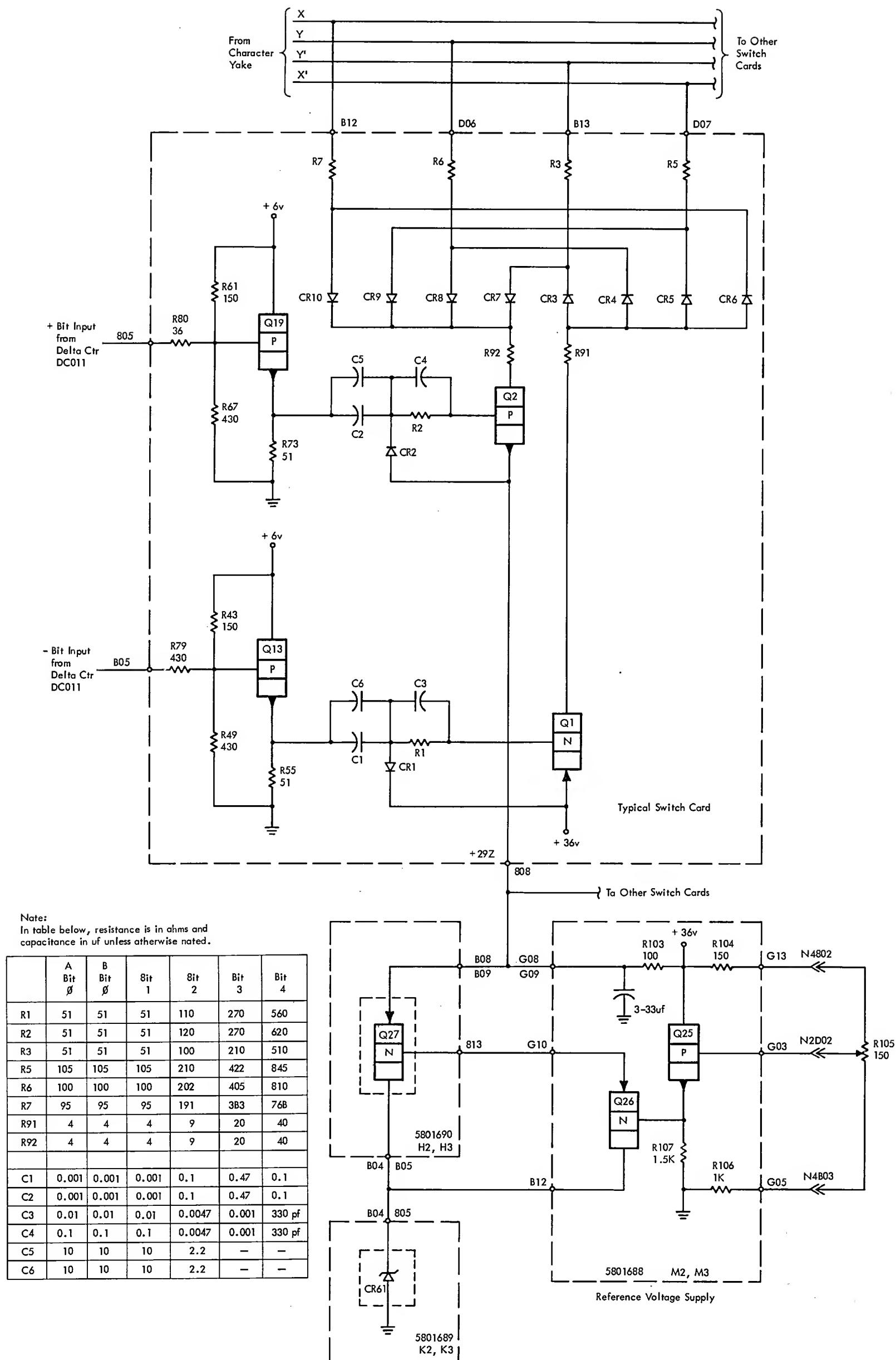


Figure 9019. Absolute Vector Graphics Deflection Control, Typical Switch and Reference Voltage Circuits

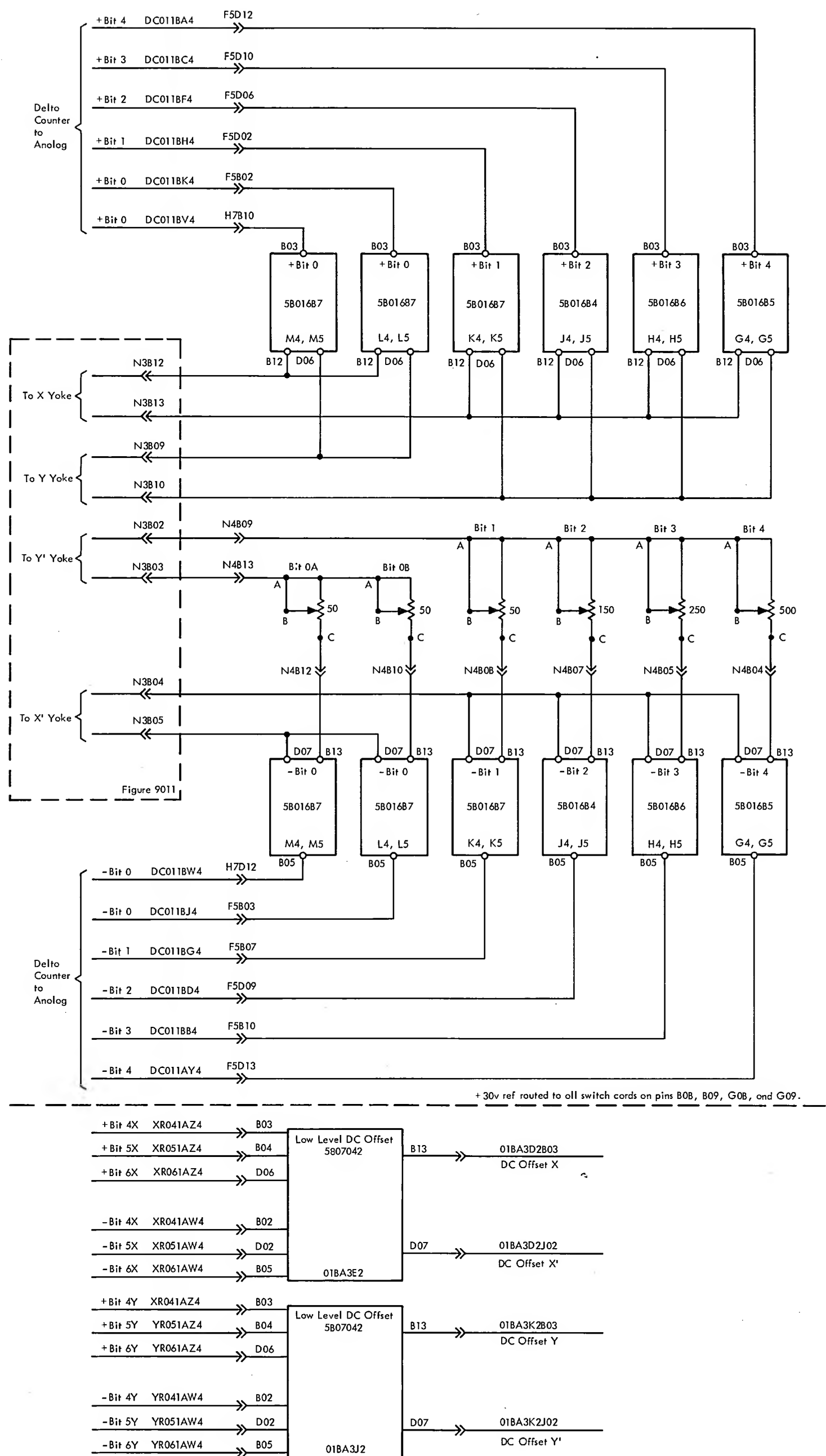
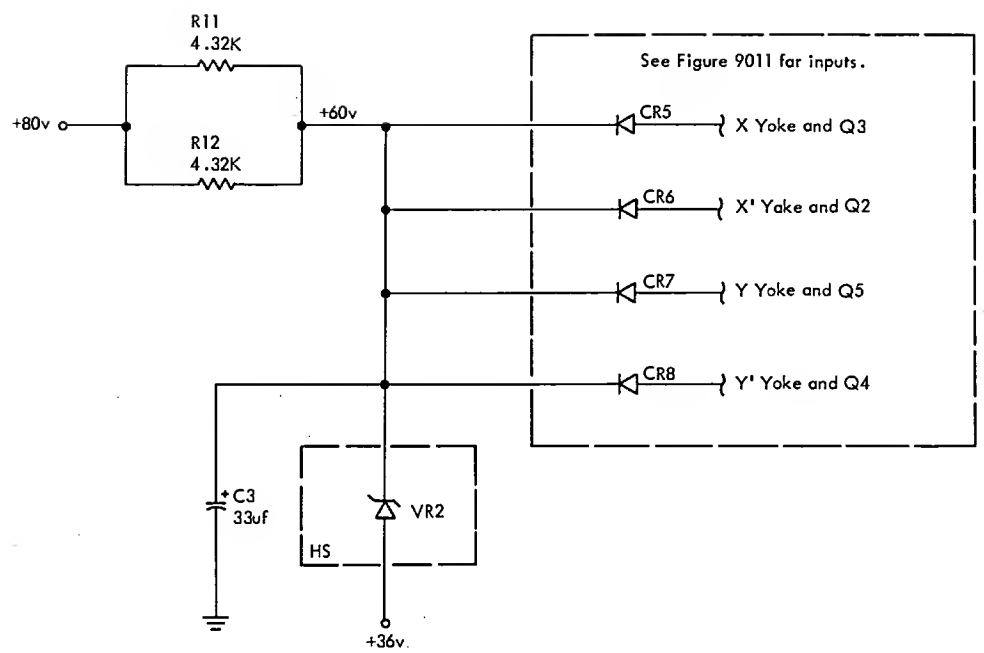
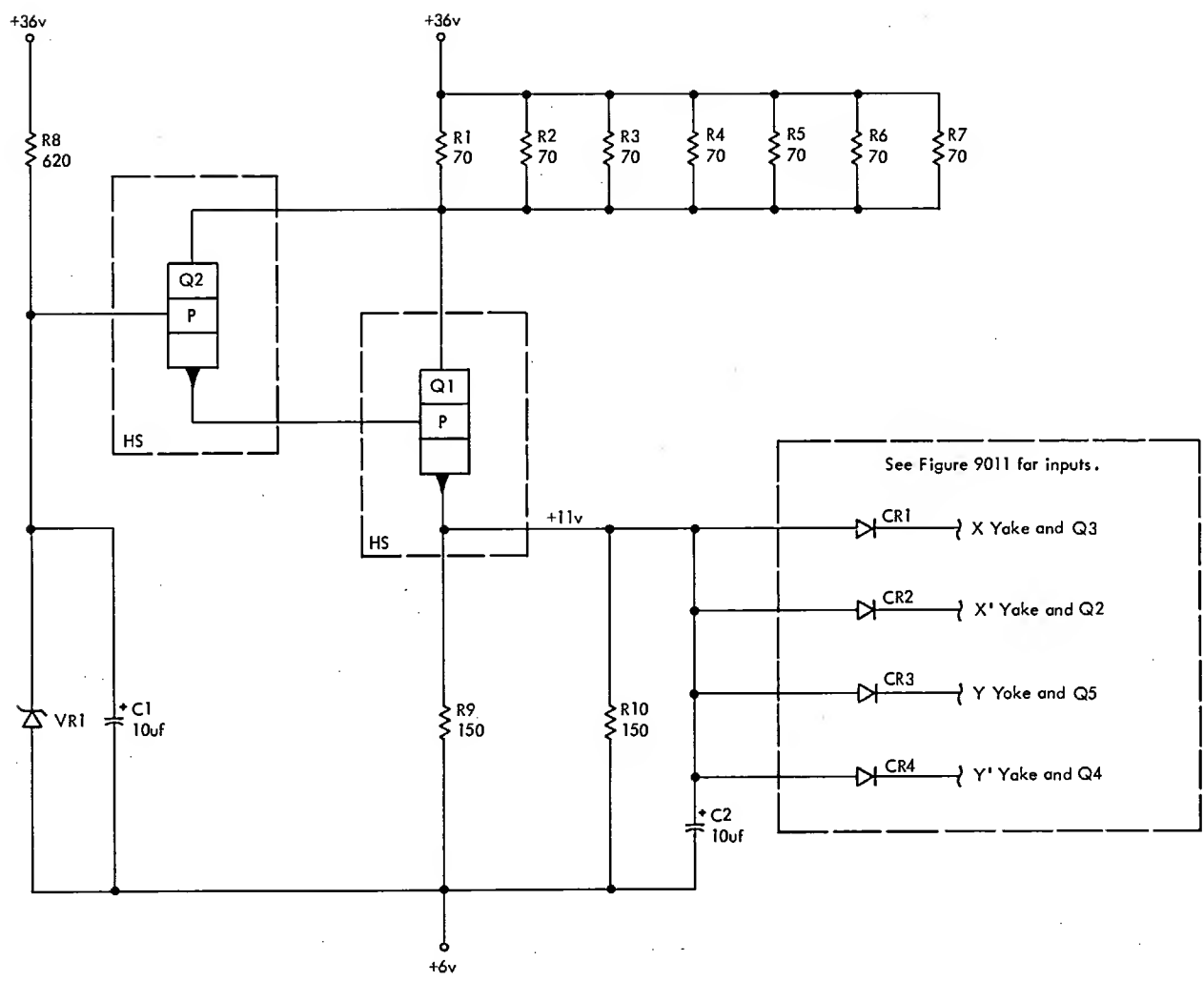


Figure 9020. Absolute Vector Graphics Deflection Control, Delta Counter Switching Circuits



Up Level Yoke Clamp Circuit



Down Level Yoke Clamp Circuit

Figure 9021. Yoke Clamp Circuits

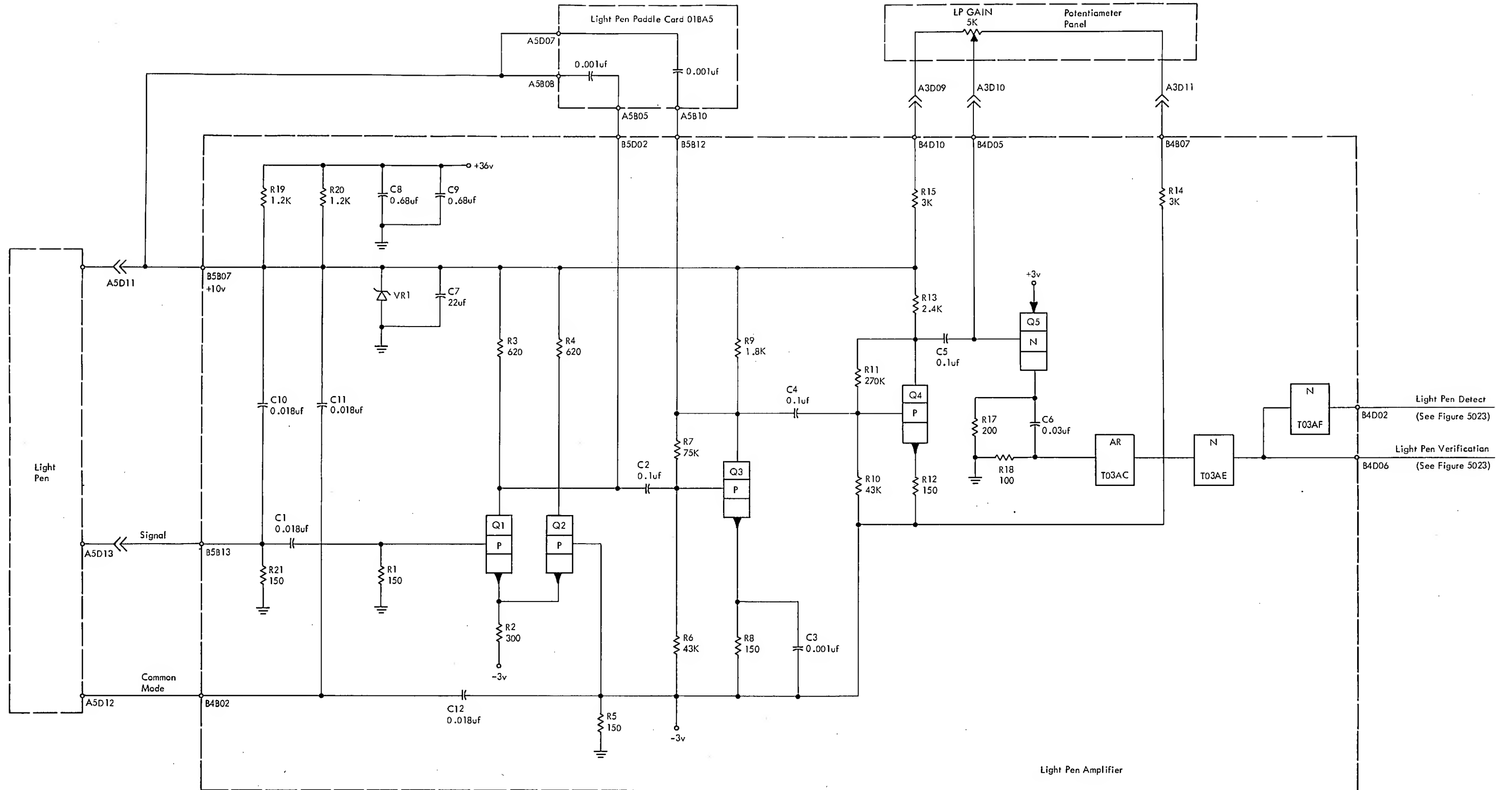


Figure 9022. Light Pen Amplifier Wiring Diagram

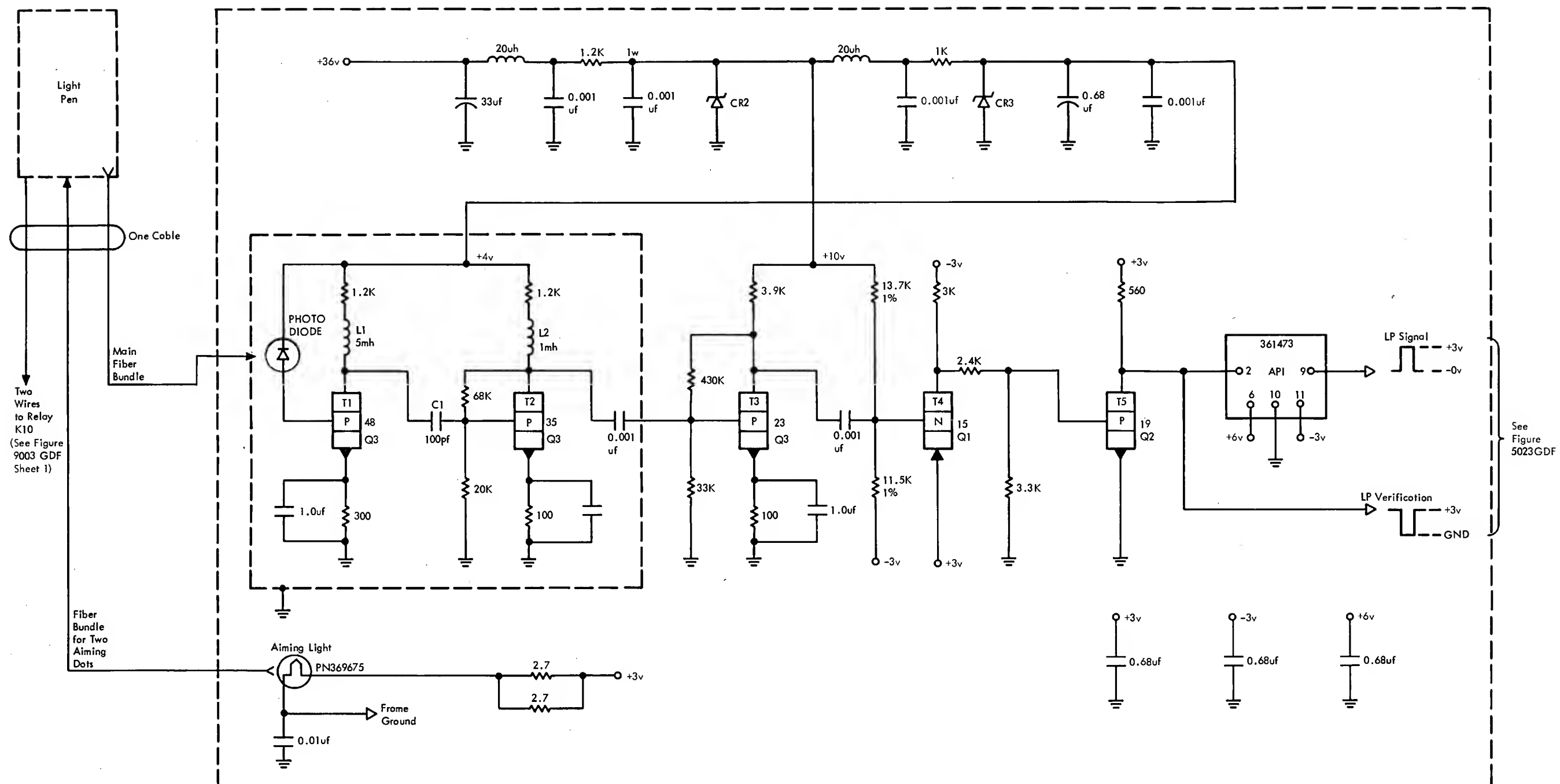
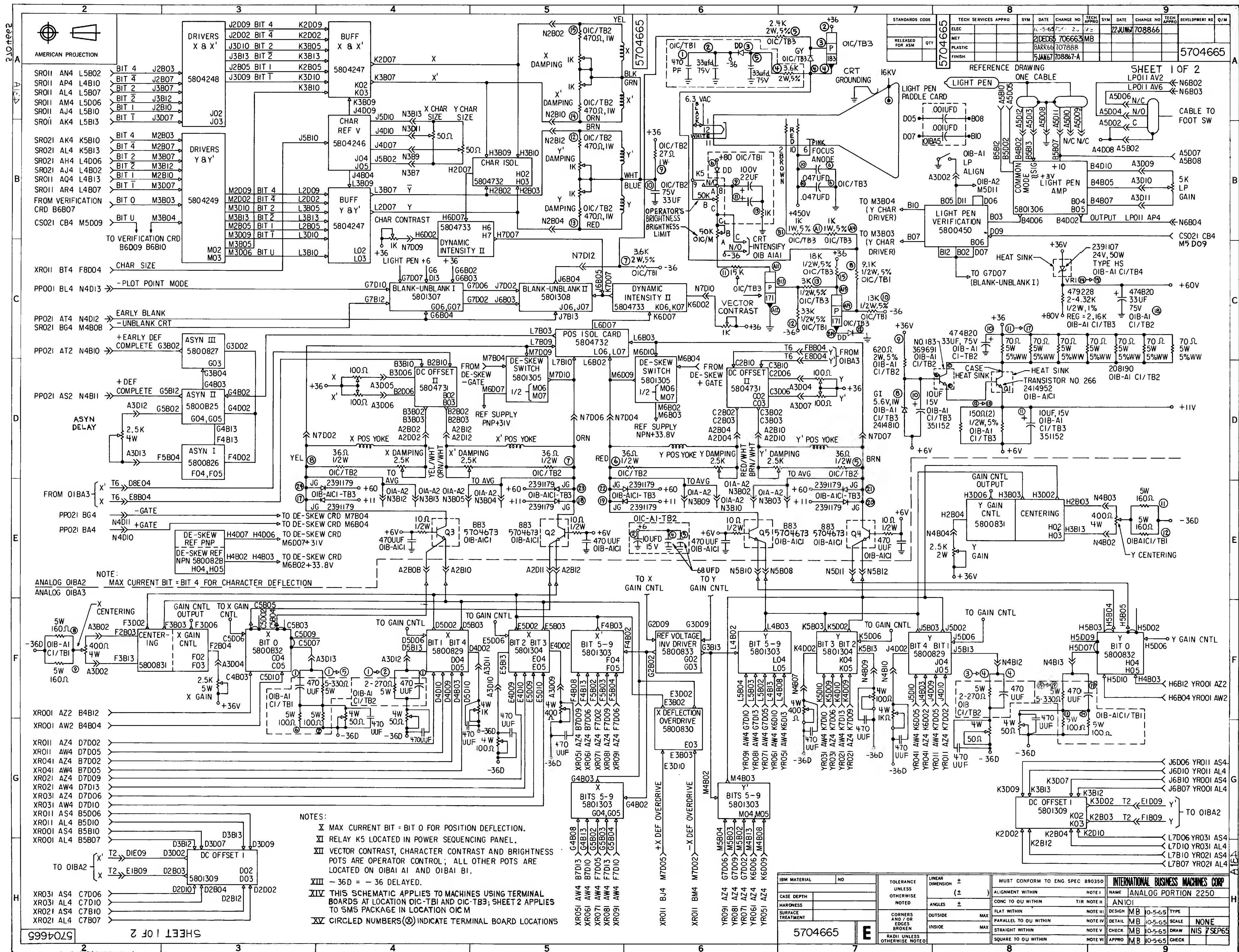
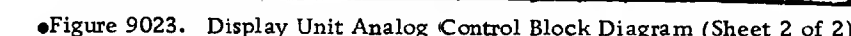


Figure 9022GDF. Light Pen Amplifier Wiring Diagram (for GDF Machines)



●Figure 9023. Display Unit Analog Control Block Diagram (Sheet 1 of 2)



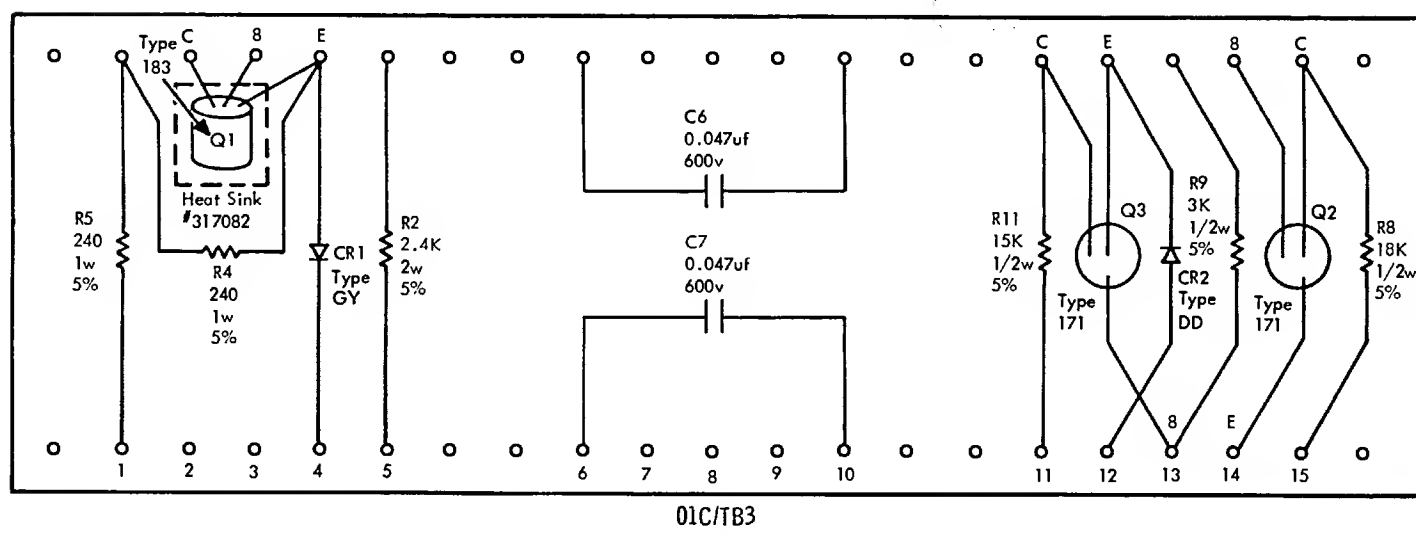
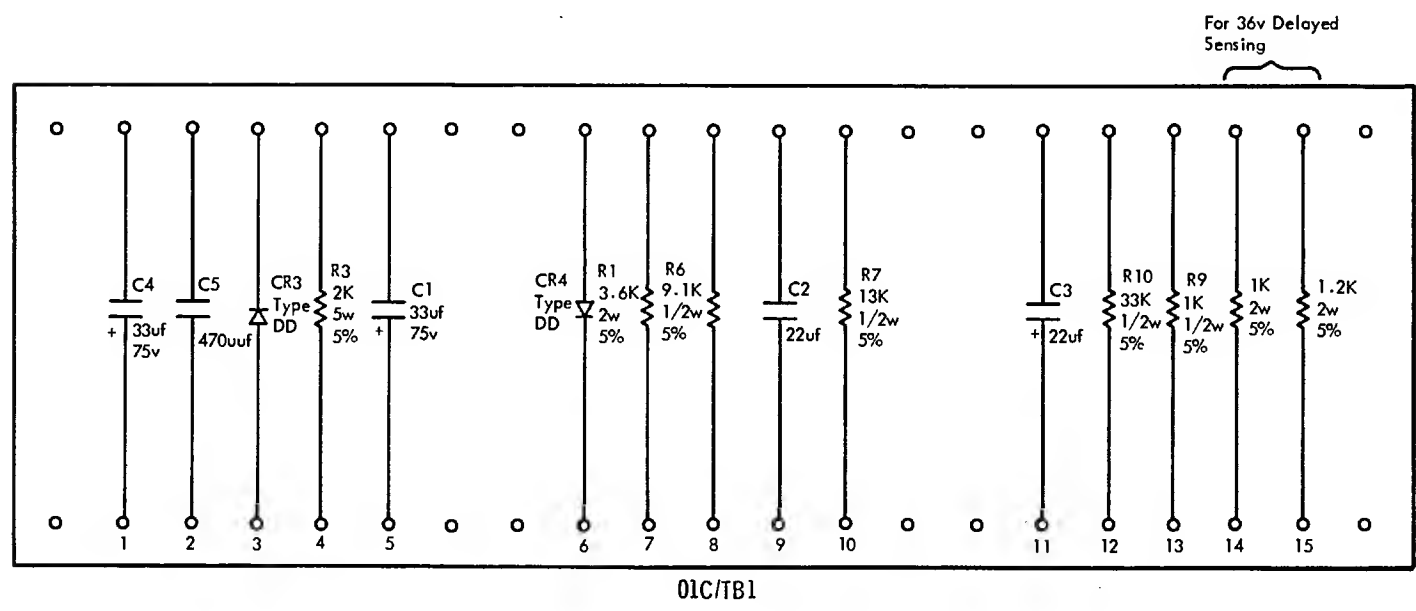
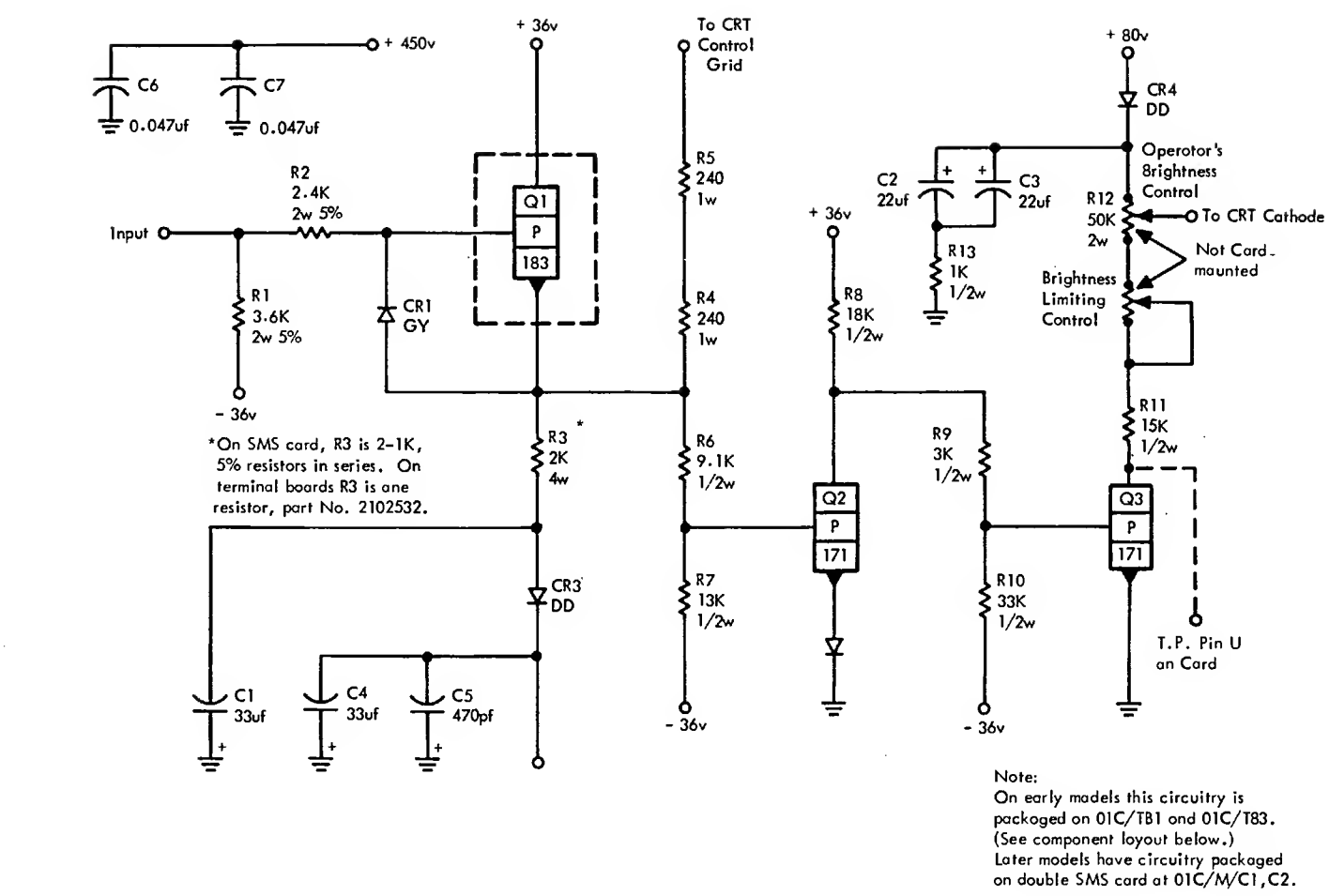


Figure 9024. Arc Protection Circuit and Component Location

A register	5002	Set Program Function Indicators	2003
Absolute vector graphics:		Write Buffer	2006, 6023
Control, simplified logic	5024	Write Direct	2000, 6000, 6022
Delta counter switching	9020		
Diagnostic test flow chart	6041	Deflection Interlock wait	6007
Typical switching circuit	9019	De-skew diagnostic flow chart	6038
Alphanumeric keyboard:		Diagnostic flow charts, analog:	
Code generation and transfer	5020	Absolute vector graphics	6041
Data encoding diagram	5018	Character generator	6036
Data entry into storage	2009	De-skew	6038
Data entry operation	2004	Intensity	6042
Encoding chart	9002	Large square	6033
Interrupt	5002	Light pen	6037
Sense and cursor data generation	5019	Master	6031
Analog wiring diagrams:		Serious display defect	6032
Absolute vector graphics	9019, 9020	Staircase	6034
Analog schematic	9023	Vector and point plot	6035
Arc-protection	9024	Graphic design feature:	
Asynchronous delay	9013	Buffer regeneration:	
Blank-unblank	9014, 9015	Graphic	6013GDF
Character deflection	9016, 9017, 9018	Proceed C and Proceed E	6013GDF
DC offset control	9010	MC search and Proceed G flow chart	6010GDF
De-skew control	9012	Transfer and No Op modes	6013GDF
Dynamic intensity	9014, 9015	Transfer order process	6015GDF
High-order decoding	9008	Buffer regeneration timing sequence	6001GDF
Low-order decoding	9009	Byte counter simplified logic	5007GDF
Position isolation	9013	Deflection interlock wait flow chart	6007GDF
Yoke clamp circuits	9021	Light pen amplifier wiring diagram	9022GDF
Yoke control	9011	Light pen detection process flow chart	6008GDF
Arc-protection circuit	9024	Light pen test flow chart	6037GDF
		Line/point sequence flow chart	6005GDF
		Power Control and Distribution wiring diagram	9003GDF
B register	5001		
Block diagram of 2250-1	1000	High-voltage power supply	9004
Buffer address counter	5009	Intensity diagnostic flow chart	6042
Buffer address register	5006	Interface control:	
Buffer regeneration:		Ending sequence	6018
Buffer cycle	6014	Initial selection sequence	6016
Cursor adjustment process	6011	Service cycle sequence	6017
Display data operation	2008		
MC search	6010	Large square diagnostic flow chart	6033
Proceed A and Proceed D	6009	Light pen:	
Proceed B	6011	Amplifier wiring diagram	9022
Proceed C and Proceed E	6013	Character detect, BAC control	2010
Proceed C and Proceed F	6012	Detection	5023
Proceed G	6010	Detection process flow chart	6008
SM search	6009	Diagnostic flow chart	6037
Timing sequence	6001	Graphic detect, BAC control	2011
Transfer order process	6015	Test flow chart	6037
Byte counter	5007	Line/point sequence	6005
		Load counter	5008
CE panel	9006		
Character generator:		Master diagnostic flow chart	6031
Block diagram	2018	MC search	6003, 6010
Buffer regeneration, Proceed C and Proceed F	6012	Mode sequence	6004
Character sequence flow chart	6006, 6040		
Character stroke control flow chart	6039	Power control and distribution	9003
Character stroke timing chart	9007	Power distribution, block diagram	9005
Data and control diagram	2001	Power-off sequence	6030
Diagnostic flow chart	6036	Power-on sequence	6029
Size A characters display	9000	Program function keyboard:	
Size B characters display	9001	Data encode and entry	5021
Stroke timing and control	5017	Data entry operation	2002
Typical operation	5000	Indicator control operation	2003
Character sequence	6006	Interrupt	5022
Character stroke timing chart	9007	Set PF Keyboard Indicators command	6021
Command validation	5010		
Commands:		Sense register	5004, 5005
Insert Cursor	6020	Serious display defect diagnostic flow chart	6032
Read Buffer	2012, 6024	SM search	6002, 6009
Read Cursor	6025	Staircase diagnostic flow chart	6034
Read Manual Inputs	6026	Status register	5003
Read X-Y Position Registers	2014	Stroke timing and control	5017
Remove Cursor	6020		
Sense	2013, 6028	Timing periods	5011, 5012, 5013, 5014, 5015
Set Buffer Address and Start	2007	Timing pulse generator	5016
Set Buffer Address and Stop	2007		
		Vector and point plot diagnostic flow chart	6035



System/Unit	2250-1
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This supplement revises and updates the IBM 2250 Display Unit Model 1, FE Diagram Manual, Form Y27-2044-1. The updated information includes changes to incorporate the Isolation Feature.

Incorporate this supplement in the original manual by substituting the attached pages for corresponding pages in the manual and by adding new pages provided.

- Replace i and ii.
- Replace 1000.
- Replace 2000, 2001, 2005 through 2013, 2016 and 2017.
- Replace 5000 and 5001.
- Replace 6006, 6007, 6008GDF, 6009, 6011 through 6013, 6013GDF, 6014, 6015, 6022, and 6023.
- Replace 9003 (3 Sheets), 9003GDF (3 Sheets), 9006, 9007, and 9023 (2 Sheets).

File this cover letter at the back of the publication. It will then serve as a record of the changes received and incorporated.

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Y27-2044-1

